MATH 3200 – **Midterm Exam Review (Ch 1- 5)** (note: review of 5.1 and 5.2 to supplement for Ch 5)

MULTIPLE CHOICE

1. What is the mapping rule for $y+6=-f\left(-\frac{1}{2}x+4\right)$?

   A) $(x,y)\to\left(\frac{1}{2}x-4,-y+6\right)$ B) $(x,y)\to\left(-\frac{1}{2}x-4,y-6\right)$

   C) $(x,y)\to(-2x-8,-y+6)$ D) $(x,y)\to(-2x+8,-y-6)$

2. The graph of $y=f(x)$ has been reflected across the x-axis and stretched vertically by a factor of 2 and translated 5 units left. Which of the equations would describe the new graph?

   A) $y=-f(2x-5)$ B) $y=2f(-x-5)$ C) $y=-2f(x+5)$ D) $y=-\frac{1}{2}f(x+5)$

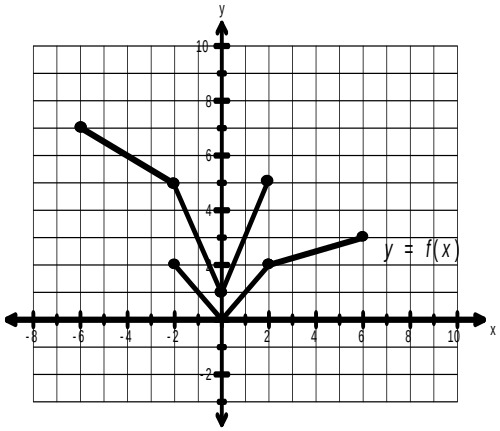
3. Which equation best describes the transformations that have been applied to $y=f(x)$ as shown in the graph?

   A) $y=2f(-x)+1$

   B) $y=\frac{1}{2}f(-x)+1$

   C) $y=-2f(x)+1$

   D) $y=-2f(x)-1$



4. Given the point (0,0) is on a graph. For which of the following transformations would it remain an invariant point?

   A) reflection in the x-axis, vertical translation

   B) reflection in the y-axis, horizontal translation

   C) any combination of translations and stretches

   D) any combination of reflections and stretches

5. If a function $y=f(x)$ has a point with coordinates $(-a,b)$, what are the coordinates of a point on the graph of $y=-3f\left(-\frac{1}{2}(x-1)\right)$?

   A) $(2a-1,-3b)$ B) $(2a+1,-3b)$ C) $\left(-\frac{a}{2}+1,-3b\right)$ D) $\left(\frac{a}{2}-1,3b\right)$

6. If a function, $y = f(x)$, has a point with coordinates $(-2,-5)$, what would the coordinates of A point on the graph of $y = f^{-1}(x)$ be?

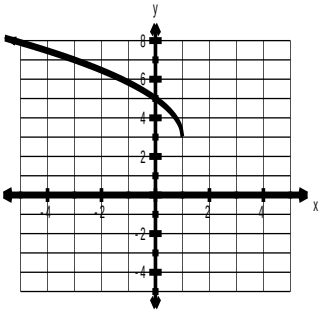
A) $(2,5)$ B) $\left(-\frac{1}{2},-\frac{1}{5}\right)$ C) $(-5,-2)$ D) $(5,2)$

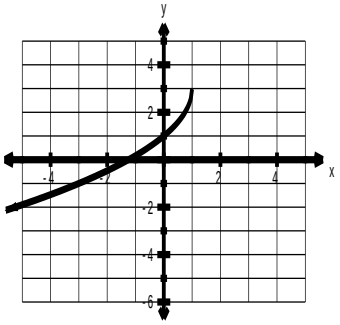
7. Given $y = f(x)$ has been transformed by a reflection in the y-axis, a horizontal stretch of $\frac{1}{4}$, a horizontal translation of 1 unit right and a vertical translation of 2 units down, what is the new equation for the image graph?

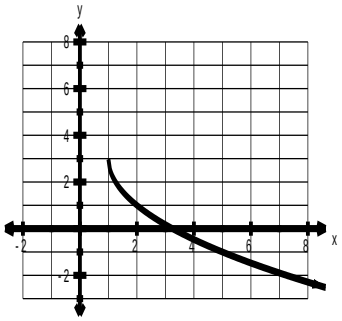
A) $y = -f(-4x+1)-2$ B) $y = f\left(-4(x-1)\right)-2$

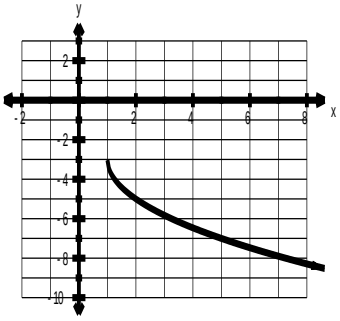
C) $y = -f(\frac{1}{4}(x+1))+2$ D) $y = f(-\frac{1}{4}x+1)+2$

8. Which of the following represents the graph of $y = -2\sqrt{x-1}+3$**?**

A) 

B) 

C) 

D) 

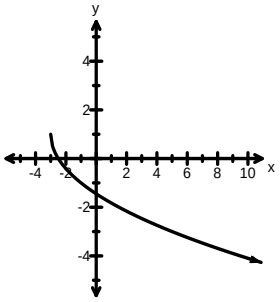
9. Given that $f(x) = \sqrt{x}$ has been stretched vertically by a factor of 5**,** reflected across the y-axis, moved up 3 units, and moved left 4 units, which of the following equations represents the transformed image?

A) $g(x) = -\sqrt{\frac{1}{5}(x+4)}+3$ B) $g(x) = \frac{1}{5}\sqrt{-(x+4)}-3$

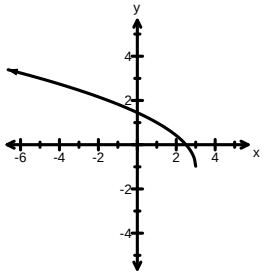
C) $g(x) = 5\sqrt{-x-4}+3$ D) $g(x) = 5\sqrt{-x+4}+3$

10. Given $f(x)=\sqrt{x}$, which of the following graphs represents a transformation $y=a\sqrt{b(x-h)}+k$ for $a>0,\ b<0,\ h>0$ and $k<0$?

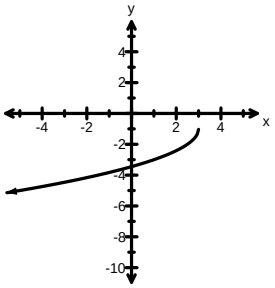
A)



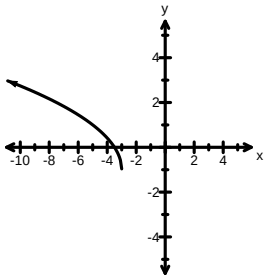
B)



C)



D)



11. What are the domain and range for $2(y-1)=-\sqrt{\frac{1}{3}x-6}$?

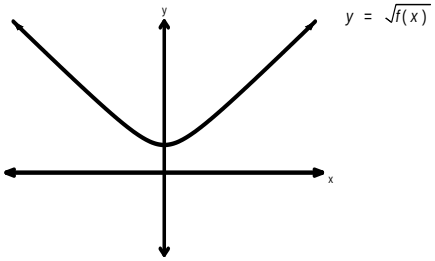
A) $D:\ \{x|x\geq 6, x\in R\}$
$R:\ \{y|y\geq 1, y\in R\}$

B) $D:\ \{x|x\geq 6, x\in R\}$
$R:\ \{y|y\leq 1, y\in R\}$

C) $D:\ \{x|x\geq 18, x\in R\}$
$R:\ \{y|y\leq 1, y\in R\}$

D) $D:\ \{x|x\geq 18, x\in R\}$
$R:\ \{y|y\geq 1, y\in R\}$

12. The graph of $y=\sqrt{f(x)}$ is shown in the graph. Which of the following equations could represent the equation for $y=f(x)$?



A) $f(x)=x^2+4$
B) $f(x)=x^2-4$
C) $f(x)=-x^2+4$
D) $f(x)=-x^2-4$

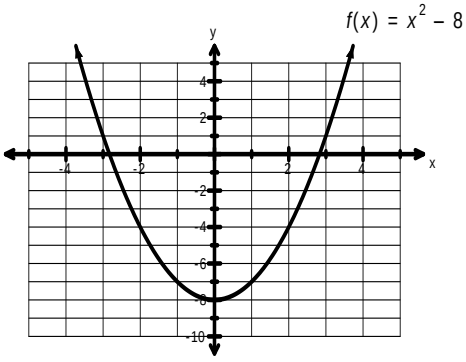
13. The domain of $y=\sqrt{bx^2-2}$ is undefined, which of the following best describes the value of 'b' ?

A) $b\leq 0$ B) $b<0$ C) $b=1$ D) $b\geq 0$

14. What is the domain of $y=\sqrt{2-3x}$?

A) $\left\{x\middle|x\geq\frac{3}{2},x\in R\right\}$ B) $\left\{x\middle|x\leq\frac{2}{3},x\in R\right\}$ C) $\left\{x\middle|x\leq 2,x\in R\right\}$ D) $\left\{x\middle|x\geq\frac{2}{3},x\in R\right\}$

15. The graph of $f(x)=x^2-8$ is given. What points would be invariant points when considering the graphs of $y=f(x)$ and $y=\sqrt{f(x)}$?



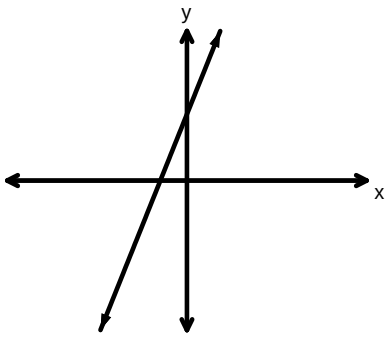
A) $(-3,0)$ and $(3,0)$

B) $\left(-2\sqrt{2},1\right)$ and $\left(2\sqrt{2},1\right)$

C) $\left(\pm2\sqrt{2},0\right)$ and $(\pm3,1)$

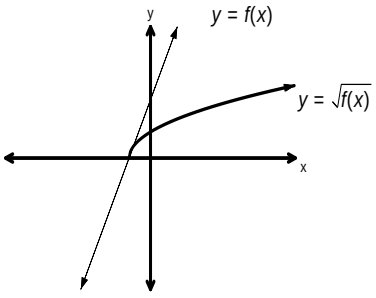
D) no invariant points

16. The graph of $y=f(x)$ is given.

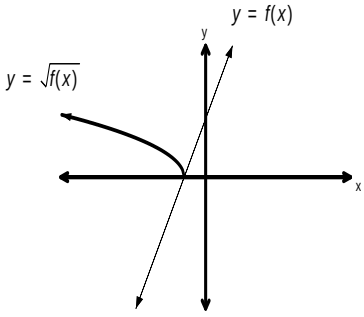


Which of the following would represent the graph of $y=\sqrt{f(x)}$?

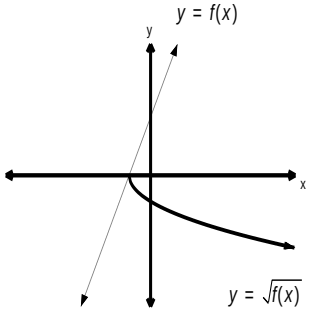
A)



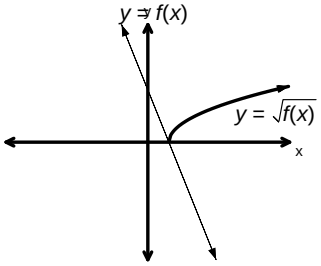
B)



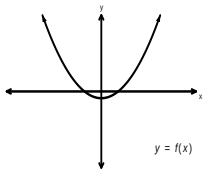
C)

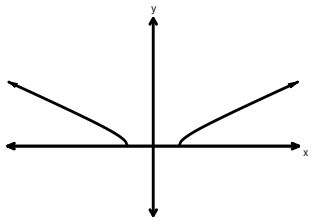


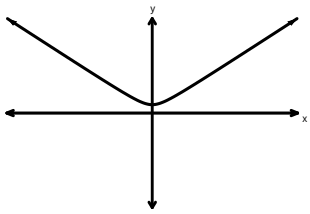
D)

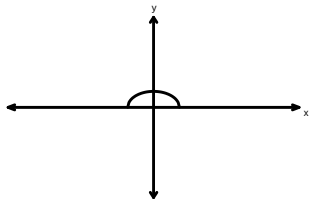


17. Given the graph of $y = f(x)$ shown , which of the following graphs would best represent the graph of $y = \sqrt{f(x)}$?



A) 

B) 

C) 

D) $y = \sqrt{f(x)}$ is not defined

18. If $f(x) = -x^2 + 16$, which best describes the domain and range of $y = \sqrt{f(x)}$?

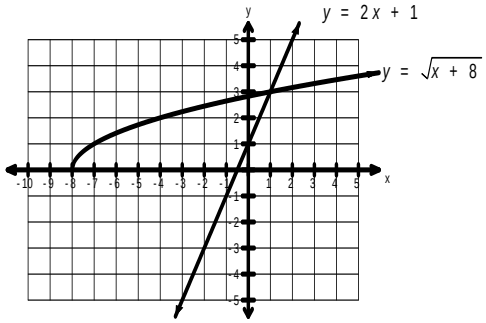
A) $D: \{x | x \in R\}$
$R: \{y | y \geq 0, y \in R\}$

B) $D: \{x | -4 \leq x \leq 4, x \in R\}$
$R: \{y | 0 \leq y \leq 4, y \in R\}$

C) $D: \{x | -4 \leq x \leq 4, x \in R\}$
$R: \{y | y \leq 4, y \in R\}$

D) $D: \{x | x \in R\}$
$R: \{y | 0 \leq y \leq 4, y \in R\}$

19. Use the graph provided to solve the equation, $\sqrt{x+8} = 2x+1$.



A) $x = -\frac{7}{4}$ and $x = 1$

B) $x = 1$

C) $(1,3)$

D) no solution

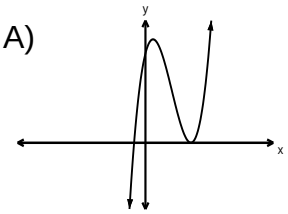
20. Which of the following is a polynomial with degree 4,having no quadratic term and a graph which extends into the third and fourth quadrants?

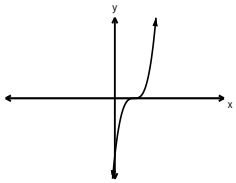
A) $P(x) = x^2 + 5$
B) $P(x) = -x^4 + 5x$
C) $P(x) = x^4 - x^3 + 5$
D) $P(x) = -4x^3 + 6x + 5$

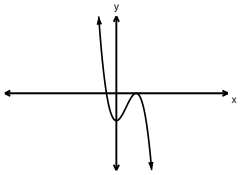
21. Which of the functions is not a polynomial function?

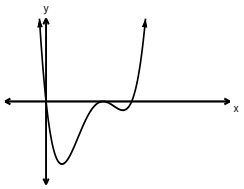
A) $P(x) = 3x^2 + 5^{-1}x$
B) $P(x) = \sqrt{3x^4 + \frac{1}{5}x}$
C) $P(x) = x + \sqrt{5}$
D) $P(x) = \frac{-x^7 + 8x^2}{2}$

22. Which of the following is the graph of an odd degree polynomial with a positive leading coefficient and a root of multiplicity 2?

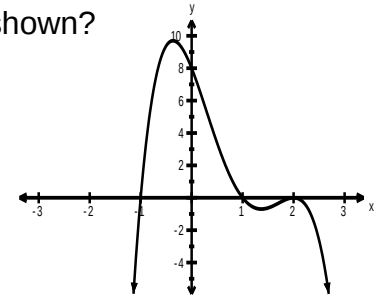
A) 

B) 

C) 

D) 

23. Which of the following equations represents the graph shown?



A) $y=-2(x+1)(x-1)(x-2)$

B) $y=-2(x+1)(x-1)(x-2)^2$

C) $y=2(x+1)(x-1)(x-2)$

D) $y=-x(x+1)(x-1)(x-2)^2$

24. What is the remainder when $p(x)=x^{71}-bx^3+3x+2$ is divided by $(x+1)$?

A) -1 B) $b+6$ C) $b-2$ D) 2

25. Given that $(3x+1)$ is a factor of $P(x)=3x^3-5x^2-26x-8$, what are the remaining factors?

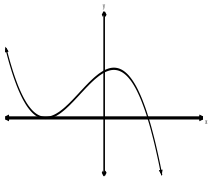
A) $(x-2)$ & $(x+4)$ B) $(x-4)$ & $(x+2)$

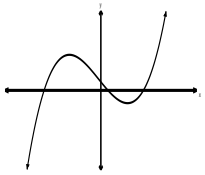
C) 3, $(x-2)$ & $(x+4)$ D) 3, $(x-4)$ & $(x+2)$

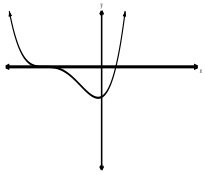
26. What is the value of k if $(x+2)$ is a factor of $2x^3-kx^2+x+3$?

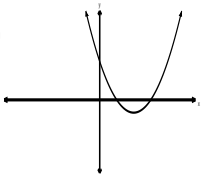
A) $-\frac{21}{4}$ B) $-\frac{15}{4}$ C) $\frac{21}{4}$ D) -2

27. Which of the following represents the graph of a polynomial with a root of odd multiplicity?

A) 

B) 

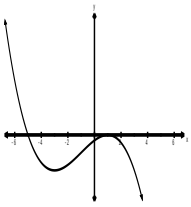
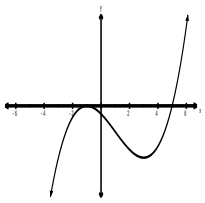
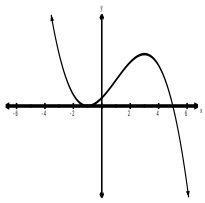
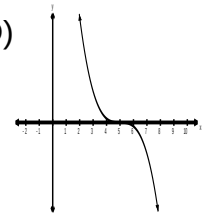
C) 

D) 

28. What is the quotient when $P(x)=2x^3+3x^2-5$ is divided by $(x+1)$?

A) $2x^2+x-1$ B) $2x^2+x-6$ C) $2x+1$ D) $2x^2+5x+5$

29. Given $P(x)$ has zeros of -1 and 5, and $P(x)<0$ only for $x\in(5,\infty)$, which of the following graphs best represents $y=P(x)$?

A)  B)  C)  D) 

30. Using the Integral Roots Theorem, what is the list of possible integral zeros for $P(x)=x^4+2x-12$?

A) $\pm1,\pm12$ B) $\pm2,\pm3,\pm4,\pm6$

C) $\pm1,\pm2,\pm3,\pm4,\pm6,\pm12$ D) $\pm1,\pm2,\pm12$

31. Which of the following statements is true?

A) A polynomial of degree 4 must have 4 real roots.
B) A polynomial whose graph lies below the x-axis only for $x\in(-1,3)$ must have only 2 real roots and therefore must be a quadratic.
C) A cubic polynomial will have 3 different real roots.
D) An odd degree polynomial must have at least one real root.

32. Convert to radian measure: 137^o

A) 0.75 B) 1.19 C) 2.39 D) 43.61

33. Convert to degree measure: 2 radians

A) 360^o B) 114.59^o C) 565.49^o D) $2\pi^o$

34. Which angle is **coterminal** to $\frac{3\pi}{5}$?

A) $-\frac{3\pi}{5}$ B) $\frac{\pi}{5}$ C) $\frac{13\pi}{5}$ D) $\frac{2\pi}{5}$

35. Which of the following represents the **reference angle** for $\frac{11\pi}{7}$?

A) $\frac{\pi}{7}$ B) $\frac{3\pi}{7}$ C) $\frac{4\pi}{7}$ D) 283°

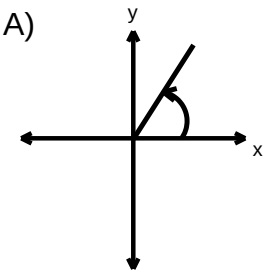
36. In the unit circle, in which quadrant is $\tan\theta$ positive and $\csc\theta$ negative?

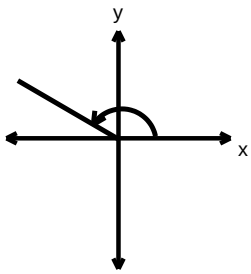
A) I B) II C) III D) IV

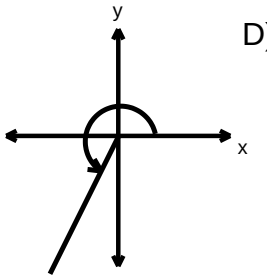
37. Find the **exact** coordinates of the point of intersection, $P(\theta)$, of the terminal arm of an angle which is in standard position in the unit circle, $\theta = \frac{11\pi}{3}$.

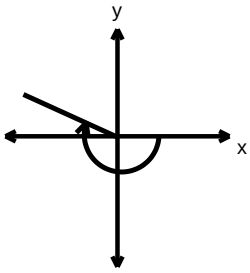
A) $\left(\frac{-\sqrt{3}}{2}, \frac{-1}{2}\right)$ B) $\left(\frac{-\sqrt{3}}{2}, \frac{1}{2}\right)$ C) $\left(\frac{-1}{2}, \frac{-\sqrt{3}}{2}\right)$ D) $\left(\frac{1}{2}, \frac{-\sqrt{3}}{2}\right)$

38. Which of the following graphs represents the angle of $\frac{5\pi}{6}$ drawn in standard position?

A) 

B) 

C) 

D) 

39. Which of the following expressions will generate all angles which are coterminal with an angle of $\frac{3\pi}{4}$?

A) $-\frac{\pi}{4} + 2\pi n,\ n \in N$ B) $\frac{\pi}{4} + \pi n,\ n \in I$

C) $\frac{3\pi}{4} + 2\pi n,\ n \in I$ D) $\frac{3\pi}{4} + 2\pi n,\ n \in N$

40. What is the exact value of $\csc^2\frac{5\pi}{3} + \tan\frac{11\pi}{6}$?

A) $4-\sqrt{3}$ B) $\frac{4+\sqrt{3}}{3}$ C) 1 D) $\frac{4-\sqrt{3}}{3}$

41. Solve $\sec^2 x - 1 = 3,\quad x \in [0, 2\pi)$?

A) $\frac{\pi}{3}, \frac{5\pi}{3}$ B) $\frac{\pi}{6}, \frac{11\pi}{6}$

C) $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$ D) $\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

42. What is the arc length of a195° angle in a circle with a diameter of 8 cm?

A) $\frac{13\pi}{3}$ cm B) $\frac{13\pi}{12}$ cm C) $\frac{26\pi}{3}$ cm D) 780 cm

43. If $2\sin x = -\sqrt{3}$, then find x. ($0° \le x < 360°$)

A) 30°, 330° B) 30°, 150° C) 210°, 330° D) 150°, 210°

44. Solve for ALL values of x: $2\tan x - 3 = -1$

A) $x = \frac{\pi}{4} + 2\pi k, k \in I$ B) $x = \frac{\pi}{4} + \pi k, k \in I$

C) $x = \frac{3\pi}{4} + 2\pi k, k \in I$ D) $x = \frac{\pi}{4}, \frac{3\pi}{4}$

45. Solve $2\sin^2 x \cos x + \sqrt{3}\sin x \cos x = 0$ for x, where $0 \le x < 2\pi$.

A) $0, \frac{\pi}{2}, \pi, \frac{4\pi}{3}, \frac{3\pi}{2}, \frac{5\pi}{3}$ B) $0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}$

C) $0, \frac{\pi}{2}, \pi, \frac{4\pi}{3}, \frac{3\pi}{2}, \frac{5\pi}{3}, 2\pi$ D) $0, \frac{\pi}{2}, \pi, \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$

46. Solve $2\cos x + 5 = 3$ for x, where $0° \le x < 360°$

A) 0° B) 90° C) 180° D) 360°

47. Solve $2\sin x = -0.506$, for $0° \le x < 360°$

A) -14.7° B) 14.7° C) 194.7°, 345.3° D) 14.7°, 165.3°

48. Determine the equation of the circle whose centre is at $(0,0)$ with a radius of $\sqrt{7}$.

A) $x^2 + y^2 = \sqrt{7}$ B) $x^2 + y^2 = 7$ C) $x^2 + y^2 = 49$ D) $x^2 + y^2 = 14$

49. Given that $P\left(x, \frac{2}{3}\right)$ is a point on the unit circle, what are the possible value(s) for x?

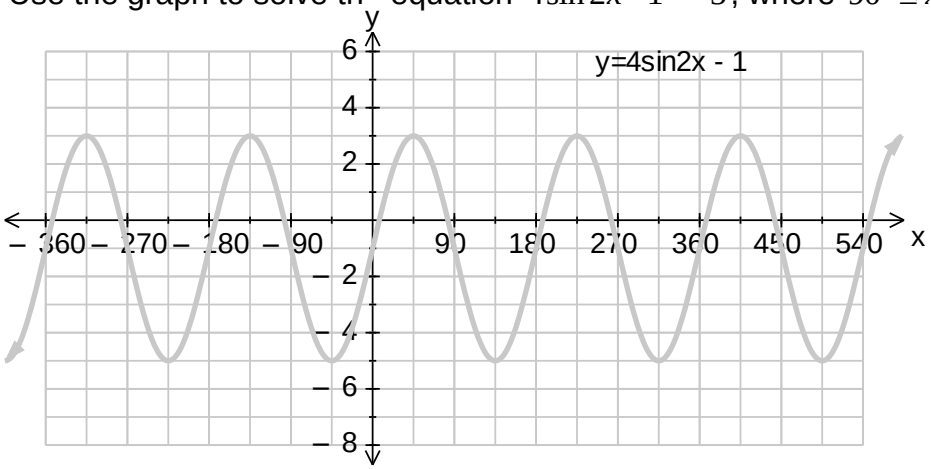
A) $\frac{1}{3}$ B) $\frac{\sqrt{5}}{3}$ C) $\pm\frac{\sqrt{5}}{9}$ D) $\pm\frac{\sqrt{5}}{3}$

50. Given $x = 45° + 120°k,\ k \in I$, list the angles for -180° < x < 270°.

A) $-175°, -75°, 45°, 175°$ B) -75°, 45°, 165°

C) 45°, 165° D) $-45°, 45°, 165°$

51. Use the graph to solve the equation $4\sin 2x - 1 = -5$, where $90° \le x \le 450°$.



A) $135°, 315°$ B) $135°, 225°, 315°$

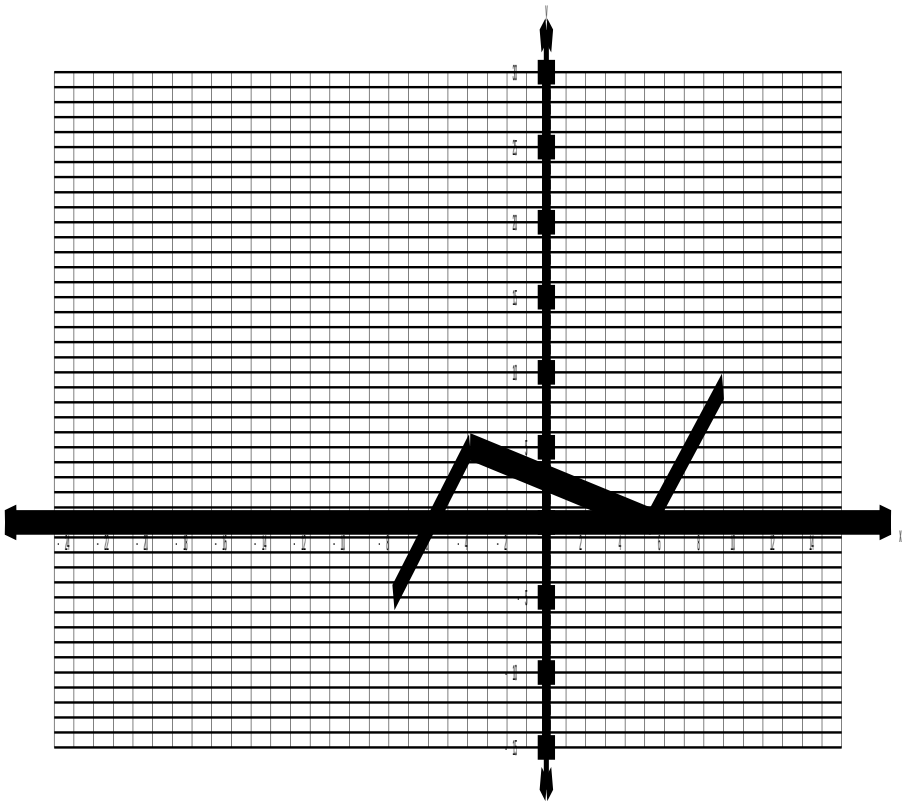
B) $-225°, -45°, 135°, 315°$ D) $-225°, -45°, 135°, 315°, 495°$

Part II

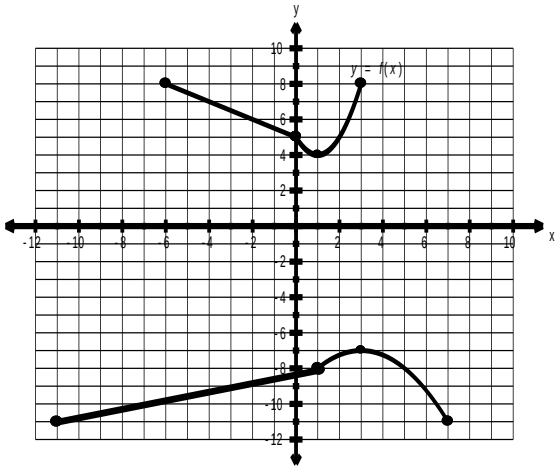
1. Given the graph $y = f(x)$ shown,

A) sketch the graph of i) $y = 3f\left(-\frac{1}{2}(x+5)\right) - 1$ ii) $y = f^{-1}(x)$

B) state any invariant points



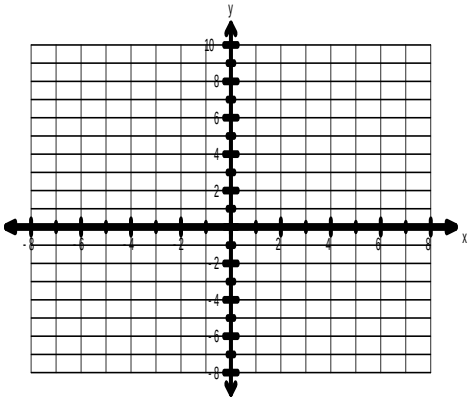
2. Determine the equation for the image of $y = f(x)$.



3. Algebraically determine the equation for $f^{-1}(x)$ if $f(x) = \frac{1}{5}(x-2)^2 + 1$ with an appropriate restriction on the domain. (State the restriction on the domain used.)

4. Sketch the graphs of each of the following functions on the grids provided.
State the domain and the range for each radical function and any invariant points

A) $y = -2x + 3$
$y = \sqrt{-2x+3}$

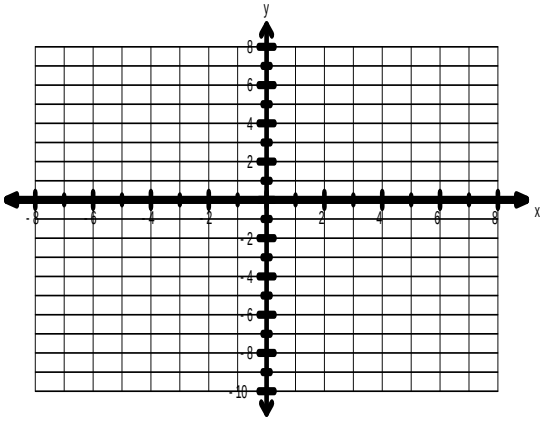


Domain:_____

Range:_____

Invariant points:_____

B) $y = 2x^2 - 8$
$y = \sqrt{2x^2 - 8}$



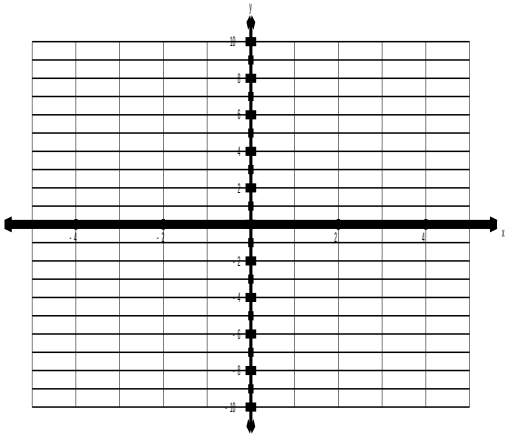
Domain:_____

Range:_____

Invariant points:_____

C) $y=-x^2+1$

$y=\sqrt{-x^2+1}$



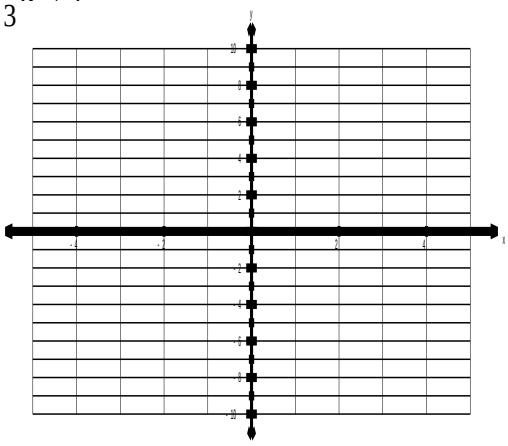
Domain:_____

Range:_____

Invariant points:_____

D) $y=\frac{1}{3}x^2+4$

$y=\sqrt{\frac{1}{3}x^2+4}$



Domain:_____

Range:_____

Invariant points:_____

5. Algebraically determine the domain of

A) $f(x)=\sqrt{2x^2-5x-12}$

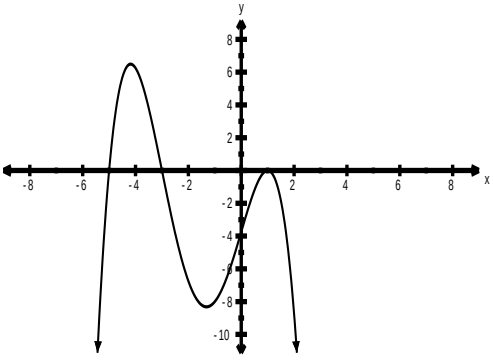
B) $f(x)=\sqrt{-\frac{1}{4}x^2-\frac{1}{4}x+\frac{3}{2}}$

6. A) Algebraically solve $\sqrt{3x+13}=2x-3$. State the restrictions on x for the equation.

B) Algebraically solve $\sqrt{x^2+5}+1=2x$. State the restrictions on x for the equation

7. A polynomial equation, $P(x)$, has a quotient of $(2x^2-x+1)$ and a remainder of -1 when divided by $(x+3)$. What is the equation to represent $P(x)$?

8. Determine the equation of the polynomial function (**in factored form**) based on the graph given below.



9. Algebraically determine the intercepts of $P(x) = 2x^3 + 3x^2 - 23x - 12$ and sketch its graph, labeling all intercepts.

10. Given that $(2x+5)$ is a factor of $P(x) = 2x^3 + 3x^2 - 9x - 10$, algebraically determine the roots of $P(x) = 2x^3 + 3x^2 - 9x - 10$.

11. A tank with a volume of 12 ft^3 has dimensions, x, $(x-1)$ and $(x+4)$. If x represents the height of the tank, and you need a tank which is at least 3ft high, write a polynomial equation to model this situation and then algebraically solve it to determine the dimensions of this tank. Use your answer to determine whether this tank will be suitable for your needs.

12. A block of ice is used to make a sculpture. The block has dimensions 3ft by 4ft by 5ft and the size of the block is reduced to 24ft^3 by shaving the same amount of ice off the length, width and height of the block. Write a polynomial equation to model this situation and then solve it algebraically to determine how much ice was shaved off each dimension.

13. Simplify. Express your answers in exact radical form.

a) $\dfrac{\sin 135° + \cos 30°}{\sin(-240°)}$ b) $\tan^2 300° + \csc 150°$ c) $\cos 330° \sec 210° - \sin(-300°)\sec^2 225°$

14. Solve each of the following trigonometric equations for $0 \le \theta < 2\pi$.

(a) $2\cos^2\theta + \sin\theta + 1 = 0$ (b) $2\cos^2\theta = \cos\theta$ (c) $\cos^2\theta - \cos\theta = \sin^2\theta$

(d) $\sin^2\theta - 5\sin\theta - 6 = 0$ (e) $2\cos^2\theta + \cos\theta - 1 = 0$ (f) $\cot\theta = 2\cos\theta$

(g) $\cos\theta\tan\theta = \cos\theta$ (h) $4\cos(3x - 20) = 1$

15. Given each of the following points lie at the intersection of a circle and the terminal arm of an angle in standard position,
i) sketch the diagram
ii) determine the values of the six trigonometric ratios
iii) determine the angle of rotation from standard position

a) $P\left(-\frac{7}{25}, \frac{24}{25}\right)$ b) $P(-2,-3)$

16. a) Given $\sin\theta = \frac{4}{5}$, $\frac{\pi}{2} \le \theta \le \frac{3\pi}{2}$, determine the value of $\cot\theta$.

b) Given $\sec\theta = -1.3$, $\pi \le \theta \le 2\pi$, determine the value of $\sin\theta$

17. a) What is the local maximum of $y = -\frac{1}{4}\sin(x+3) - 8$?

b) What is the local minimum of $y = -\frac{5}{6}\cos(x-20) + 2$?

c) What is the equation of the sinusoidal axis of a graph having a local minimum of –4 and local maximum of 12?

d) What is the horizontal stretch of $y = \cos x$ in the image graph of $5y + 15 = \cos(2x - 8)$?

e) What is the period of $-3(y+7) = \sin(\frac{1}{2}x - 10)$?

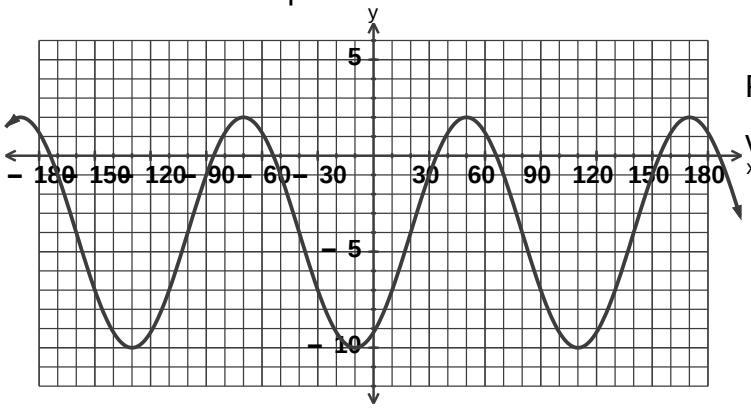
18. Sketch each of the following using the mapping rule method.

a) $\frac{1}{3}(y+1) = \sin 2(x - 90°)$ b) $y = -2\cos(3x + 120°) - 4$

19. A sinusoidal function is given in the form $\frac{1}{a}(y-d) = \cos\frac{1}{b}(x-c)$. What is the effect of each transformation on the original function?

a) a = 4, d> 0, b = 1, c < 0º b) a < 1, d< 0, 0 < b < 1, c= 30º

20. Determine the equation of the sinusoidal curve. The base graph is $y = \sin x$.



Phase shift:(HT) _____ HS : ____

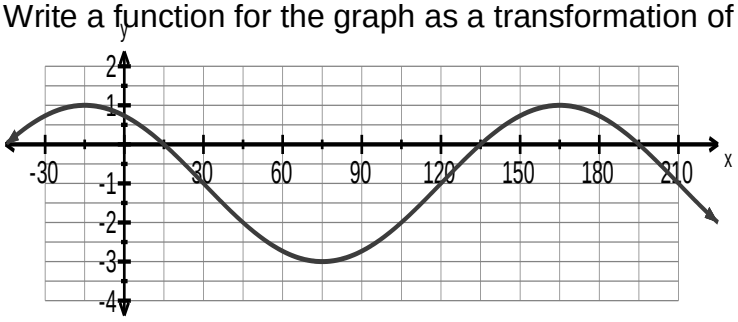
vertical displacement(VT): _____ VS : _____

Period : _____ Amplitude : _____

Equation of Sinusoidal Axis : _____

Equation of the function : _____

21. Write a function for the graph as a transformation of y = cos x.



Answers:

1. D	2. C	3. A	4. D	5. B	6. C	7. B
8. C	9. C	10. B	11. C	12. A	13. A	14. B
15. C	16. A	17. A	18. B	19. B	20. B	21. B
22. A	23. B	24. C	25. B	26. B	27. C	28. A
29. C	30. C	31. D	32. C	33. B	34. C	35. B
36. C	37. D	38. B	39. C	40. D	41. D	42. A
43. C	44. B	45. A	46. C	47. C	48. B	49. D
50. B	51. A					

Part II

1. A) i) Using key points (-8,-5), (-4,5) , (5,0), & (9,9) on original graph yields new graph with key points (11,-16), (3,14), (-15,1) and (-23, 26).

   ii) new graph has key points (-5,-8), (5,-4) (0,5) (9,9)

   B) i) no invariant points ii) (2,2) and (9,9)

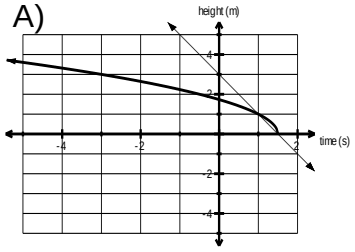
2. $y = -f\left(\frac{1}{2}(x+1)\right) - 3$

3. $f(x) = \frac{1}{5}(x-2)^2 + 1, \quad x \geq 2$ has $f^{-1}(x) = 2 + \sqrt{5(x-1)}$ (domain of $f^{-1}(x)$ is $x \geq 1$, range: $y \geq 2$)

   while $f(x) = \frac{1}{5}(x-2)^2 + 1, \quad x \leq 2$ has $f^{-1}(x) = 2 - \sqrt{5(x-1)}$ (domain of $f^{-1}(x)$ is $x \geq 1$, range: $y \leq 2$)

.

4. A)

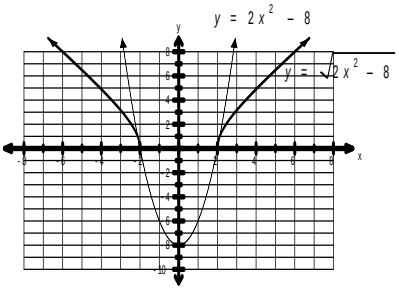


Domain: $\left\{x \middle| x \leq \frac{3}{2},\ x \in R\right\}$

Range: $\left\{y \middle| y \geq 0,\ y \in R\right\}$

Invariant points: $\left(\frac{3}{2}, 0\right)$ and $(1,1)$

B)

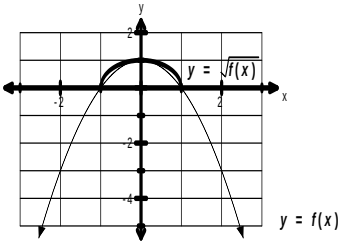


Domain: $\left\{x \middle| x \leq -2 \text{ or } x \geq 2,\ x \in R\right\}$

Range: $\left\{y \middle| y \geq 0,\ y \in R\right\}$

Invariant points: $(\pm 2, 0)$ and $\left(\pm\frac{3\sqrt{2}}{2}, 1\right)$

C)

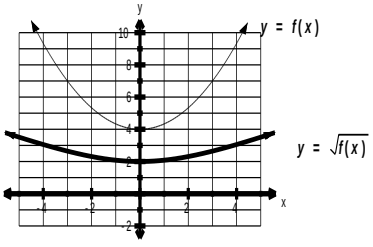


Domain: $\left\{x \middle| -1 \leq x \leq 1,\ x \in R\right\}$

Range: $\left\{y \middle| 0 \leq y \leq 1,\ y \in R\right\}$

Invariant points: $(\pm 1, 0)$ and $(0,1)$

D)



Domain: $\left\{x \middle| x \in R\right\}$

Range: $\left\{y \middle| y \geq 2,\ y \in R\right\}$

Invariant points: none

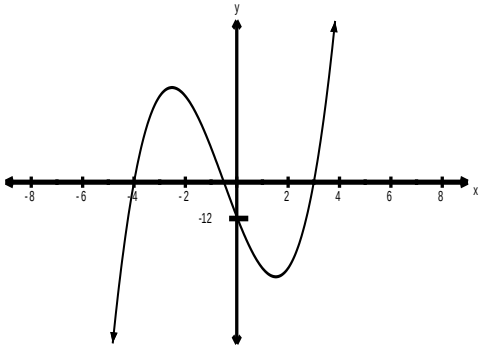
5. A) $\left\{x \middle| x \le -\frac{3}{2} \text{ or } x \ge 4,\ x \in R\right\}$ B) $\left\{x \middle| -3 \le x \le 2,\ x \in R\right\}$

6. A) x= 4, restrictions : $x \ge -\frac{13}{3}$ B) x = 2 (no restrictions on x since x^2+5 is always positive)

7. $P(x) = 2x^3 + 5x^2 - 2x + 2$

8. $P(x) = -\frac{1}{4}(x-1)^2(x+3)(x+5)$

9. x-intercepts: x= -0.5, 3, 4, y-intercept = -12



10. $x = -\frac{5}{2},\ -1,\ 2$

11. need to solve $x(x-1)(x+4) = 12$ which gives $x = 2$ as the only possible solution $\Rightarrow$ tank is not suitable since it is less than 3ft high.

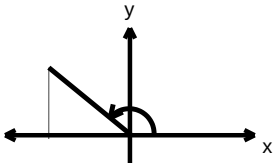
12. need to solve $(3-x)(5-x)(4-x) = 24$ which gives $x = 1$ the only real solution.

13. a) $\frac{\sqrt{6}+3}{3}$ b) $\frac{5}{2}$ c) $-1-\sqrt{3}$

14. a) $\theta = \frac{3\pi}{2}$ b) $\theta = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{3}, \frac{5\pi}{3}$ c) $\theta = \frac{2\pi}{3}, \frac{4\pi}{3}, 0$ d) $\theta = \frac{3\pi}{2}$ e) $\theta = \frac{\pi}{3}, \frac{5\pi}{3}, \pi$ f) $\theta = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}$

g) $\theta = \frac{\pi}{4}, \frac{5\pi}{4}$ h) 0.82, 2.89, 5.01

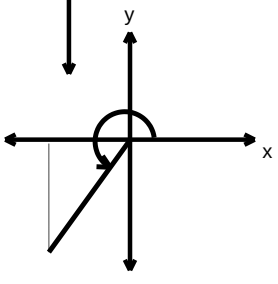
15. a)



$\cos\theta = -\frac{7}{25},\ \sin\theta = \frac{24}{25},\ \tan\theta = -\frac{24}{7},\ \sec\theta = -\frac{25}{7},\ \csc\theta = \frac{25}{24},\ \cot\theta = -\frac{7}{24}$

$\theta \approx 106.3^o$ or 1.86 rad

b)



$\cos\theta = -\frac{2\sqrt{13}}{13},\ \sin\theta = -\frac{3\sqrt{13}}{13},\ \tan\theta = \frac{3}{2},\ \sec\theta = -\frac{\sqrt{13}}{2},\ \csc\theta = -\frac{\sqrt{13}}{3},\ \cot\theta =$

$\theta \approx 236.3^o$ or 4.12

16. a) $-\frac{3}{4}$ b) $-\frac{\sqrt{69}}{13} \approx -0.6390$ c) $-\sqrt{3}$

17. 27. a) -7.75 b) $1\frac{1}{6}$ c) y = 4 d) $\frac{1}{2}$ e) 720º

18. a) $(x,y)\rightarrow\left(\frac{1}{2}x+90,3y-1\right)$, b) $(x,y)\rightarrow\left(\frac{1}{3}x-40,-2y-4\right)$,

x	y
90	-1
135	2
180	-1
225	-4
270	-1

x	y
-40	-6
-10	-4
20	-2
50	-4
80	-6

19. a) VS 4, y = +#, HT h units to the right b) reflection in x-axis, y = -#, HS between 0 and 1, HT 30º to the right 20. HT: 20, HS: $\frac{1}{3}$, VT: -4, VS: 6, P: 120º, A: 6, S.A. y = -4, e.g. $\frac{1}{6}(y+4)=\sin 3(x-20)$ 21. HS: $\frac{1}{2}$, HT: -15º, VS: 2, VT: -1, e.g. $\frac{1}{2}(y+1)=\cos 2(x+15)$