Study Guide for Common Assessment

1. Given $f(x) = 3x^2 + 2x - 4$, find $f(3)$.

a. 2 b. 52 c. 12 d. 29 e. None of these

$f(3) = 3(3)^2 + 2(3) - 4 = 27 + 6 - 4 = 29$

2. If $f(x) = 3x + 2$ and $g(x) = 7 - 3x$, find $(f - g)(5)$.

a. 11 b. 55 c. -5 d. 25 e. None of these

$(f-g)(x) = (3x+2) - (7-3x) = 6x - 5$

$(f-g)(5) = 6(5) - 5 = 25$

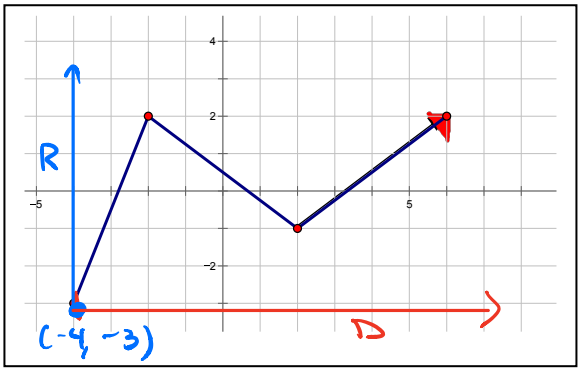
OR

$f(5) = 3(5)+2 = 17$

$g(5) = 7 - 3(5) = 7 - 15 = -8$

$17 - (-8) = 25$

3. Select the proper domain and range of the function show below:



a. D = [-4,6]; R = [-3,2]
b. D = [-4, ∞); R = [-3, ∞)
c. D = [-3, ∞); R = [-4, ∞)
d. D = (-∞, ∞); R = (-∞, ∞)
e. None of these.

Recall Domain is associated with the input (x).
Range is associated with the output (y).

4. Which of the following is a quadratic function whose graph is a parabola which has a vertex at $(-2,3)$ and opens up?

a. $y = -(x - 2)^2 + 3$ b. $y = -(x + 2)^2 + 3$ c. $y = (x + 2)^2 + 3$
d. $y = (x - 2)^2 + 3$ e. $y = (x - 2)^2 - 3$

Note the leading coefficient must be positive, eliminating a + b. (opens up)

recall: Standard form $y = a(x-h)^2 + k$

5. What is the vertex of $x = y^2 + 6y + 15$?

a. $(6, -3)$ b. $(-3,6)$ c. $(-12, -3)$ d. $(-3, -12)$ e. None of these

$y = \frac{-b}{2a} = -6/2(1) = -3$

IF $y = -3$, $x = (-3)^2 + 6(-3) + 15 = 9 - 18 + 15 = 6$

6. Find the slope of a line that is perpendicular to the line that contains the points $(-3, 4)$ and $(2,1)$.

a. $\frac{3}{5}$ b. $\frac{5}{3}$ c. $-\frac{3}{5}$ d. $-\frac{5}{3}$ e. None of these

Slope of the original line is $\frac{4-1}{-3-2} = \frac{3}{-5}$

Slope of the perpendicular is the negative reciprocal so, $5/3$.

7. Select the linear function that has a slope of -4 and a y-intercept of $(0, -7)$.

a. $y = -7x + 4$ b. $y = 4x + 7$ c. $y = -4x + 7$ d. $y = 4x - 7$ e. None of these

$m = -7$, y-intercept $(0,4)$ | $m = 4$, $(0,7)$ | $m = -4$, $(0,7)$ | $m = 4$, $(0,-7)$

second way

You could also write $y = -4x+b$ & substitute $(-7,0)$ in the equation. Thus $0 = -4(-7)+b \rightarrow b = -28$. Thus the equation $y = -4x-28$ has a slope of -4 and a x-intercept of $(-7,0)$.

8. Select the linear function that has a slope of -4 and a x-intercept of $(-7, 0)$.

a. $y = -7x + 4$ $m = -7$ b. $y = 4x + 7$ $m = 4$ c. $y = -4x + 7$ $m = -4$ d. $y = 4x - 7$ $m = -7$ e. None of these

Choice C is the only one with the correct slope. But when $y = 0$ we get $0 = 4x+7$, so $x = -7/4$, which is the incorrect x-intercept.

9. Which of the following is a decreasing linear function going through the origin?

a. $y = \frac{3}{5}x$ Increasing Through $(0,0)$

b. $y = -2x + 4$ Decreasing Not through $(0,0)$

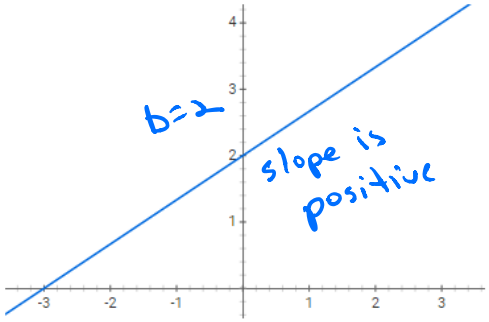
c. $y = 4x$ Increasing Through $(0,0)$

d. $y = -\frac{3}{5}x$ Decreasing through $(0,0)$

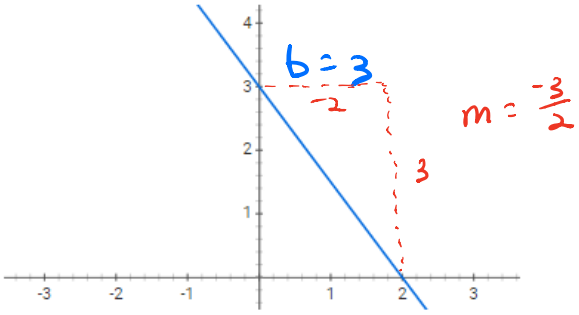
e. None of these

10. Which of the following is the graph of the linear function $f(x) = -\frac{2}{3}x + 2$?

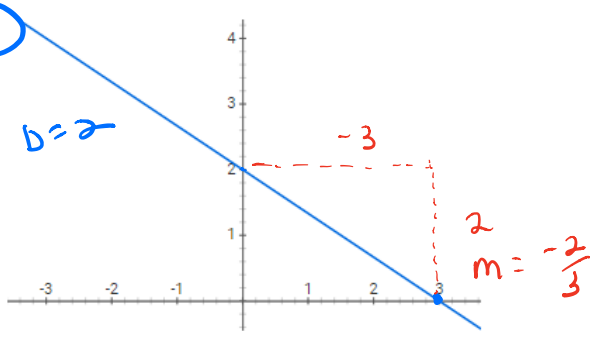
a.



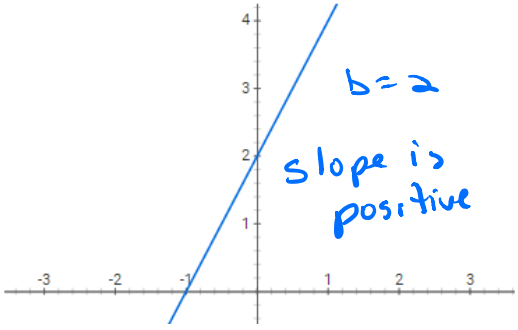
b.



c.



d.



e. None of the above

11. Select the description that fits the graph of the quadratic function $y = 2x^2 - 8x + 13$.

a. y-intercept $(0, 13)$ and vertex of $(2, 5)$.

b. y -intercept $(13, 0)$ and vertex of $(2, 5)$.

c. y -intercept $(0, 19)$ and vertex of $(-2, -1)$.

d. y -intercept $(19, 0)$ and vertex of $(-2, -1)$.

e. None of these

Let $x = 0$. The y-intercept is $(0,13)$.

Vertex: $x = \frac{-(-8)}{2(2)} = \frac{8}{4} = 2$

$y = 2(2)^2 - 8(2) + 13$

$= 8 - 16 + 13$

$= 5$

$(2,5)$

12. Identify the description that fits the graph of $h(x) = (x+5)^3(x-7)^2(x-1)$.

a. Crosses the x-axis at $(5,0)$ and $(-1,0)$ and bounces off the x -axis at $(-7,0)$.
b. Crosses the x -axis at $(-7,0)$ and bounces off the x -axis at $(5,0)$ and $(-1,0)$.
c. Crosses the x -axis at $(-5,0)$ and $(1,0)$ and bounces off the x -axis at $(7,0)$.
d. Crosses the x -axis at $(7,0)$ and bounces off the x -axis at $(-7,0)$ and $(1,0)$.
e. None of these

zeros	-5	7	1
multiplicity	3	2	1
	C	B	C

$3+2+1=6$

13. What is the degree of the polynomial function $h(x) = (x-5)^3(x-7)^2(x-1)$.

a. 2 b. 3 c. 5 d. 6 e. 7

Degree $1+2+3+2=8$

14. Specify the degree and end behavior of $y = -x(x-3)^2(x-1)^3(x+4)^2$.

a. Degree = 3; End behavior: up/down.
b. Degree = 7; End behavior: down/up
c. Degree = 8; End behavior: down/up.
d. Degree = 8; End behavior: down/down.
e. None of these

down / down

15. Solve $\log(x+3) - \log(x) = 1$ for x.

a. 3 b. $-\frac{1}{3}$ c. -3 d. $\frac{1}{3}$ e. None of these

$\log\left(\frac{x+3}{x}\right) = 1$,

$10^1 = \frac{x+3}{x}$

$10x = x+3$

$9x = 3$

$x = 3/9 = 1/3$

Note: You should check. When $1/3$ is substituted in for x, each expression is defined.

16. If $g(x) = 8x + 11$, then $g^{-1}(x) =$

a. $-8x - 11$ b. $\frac{x+11}{-8}$ c. $\frac{x-11}{8}$ d. $11x + 8$ e. None of these

$y = 8x+11$

$x = 8y+11$

$x - 11 = 8y$

$y = \frac{x-11}{8}$

$g^{-1}(x) = \frac{x-11}{8}$

17. When $g(x) = 4x - 11$, and $f(x) = 2x^2 + 5$, then $(g \circ f)(x) =$

a. $2x^2 - 10$ b. $4x^2 - 28x + 46$ c. $2x^2 - 13$ d. $2x^3 - 7x^2 - 6x + 21$ e. $8x^2 + 9$

$(g \circ f)(x) = g(f(x))$

$= g(2x^2+5)$

$= 4(2x^2+5) - 11 = 8x^2 + 20 - 11 = 8x^2 + 9$

18. Choose the ordered pair that is a solution of the system: $\begin{cases} x + y = 2 \\ 2x + y = 3 \end{cases}$

a. $(1, 1)$ b. $(-1, 1)$ c. $(1, -1)$ d. $(2, 0)$ e. None of these

Solve by elimination

$-x - y = -2$

$2x + y = 3$

$x = 1$

$1 + y = 2$

$y = 1$

$(1, 1)$

Could also solve using Substitution.

19. Which of the following is a solution for the system $\begin{cases} x + 9y = 9 \\ 6x - 7y = -7 \end{cases}$

a. $(0, 0)$ b. $(1, 1)$ c. $(1, 0)$ d. $(0, 1)$ e. None of these

I will use substitution.

$x = 9 - 9y$

$6(9 - 9y) - 7y = -7$

$54 - 54y - 7y = -7$

$54 - 61y = -7$

$-61y = -61$

$y = 1$

$x = 9 - 9(1)$

$x = 0$

20. Find the solution of this system of equations: $\begin{cases} 5x + y = 11 \\ 3x - 2y = 4 \end{cases}$

a. The system has no solutions.
b. The system has an infinite number of solutions.
c. The system has one solution with x positive and y positive.
d. The system has one solution with x negative and y positive.
e. The system has one solution with x positive and y negative.

$y = 11 - 5x$

$3x - 2(11 - 5x) = 4$

$3x - 22 + 10x = 4$

$13x = 26$

$x = 2$

$y = 11 - 5(2) = 1$

21. Solve the following system: $\begin{cases} 3x + 9y + 6z = 3 & E1 \\ 2x + y - z = 2 & E2 \\ x + y + z = 2 & E3 \end{cases}$

a. $(1, 2, -3)$
b. $(-2, 1, 0)$
c. $\left(\frac{1}{2}, 3, 2\right)$
d. $(2, -1, 1)$
e. None of these

E2 + E3

$3x + 2y = 4$ E4

6E2 + E1

$12x + 6y - 6z = 12$

$3x + 9y + 6z = 3$

$15x + 15y = 15$

so $x + y = 1$ E5

E4 - 2E5

$3x + 2y = 4$

$-2x - 2y = -2$

$x = 2$

Sub $x = 2$ in E5

$2 + y = 1$

$y = -1$

Sub $x = 2$ & $y = -1$ in E3

$2 - 1 + z = 2$

$1 + z = 2$

$z = 1$

$(2, -1, 1)$

Note: You can easily check this in each equation.

22. What is the distance between the two points $(-6, -4)$ and $(0, -2)$

a. $x = 60$
b. $x = \sqrt{40}$
c. $x = 2\sqrt{10}$
d. $y = 32$
e. None of the above

$D = \sqrt{(-6-0)^2 + (-4-(-2))^2}$

$= \sqrt{(-6)^2 + (-2)^2} = \sqrt{36+4} = \sqrt{40}$

Note this is not simplified.

$\sqrt{40} = \sqrt{4}\sqrt{10} = 2\sqrt{10}$

23. Solve for x: $\log_2(x+2) + \log_2 4 = \log_2 32$.

a. $x = 2$ b. $x = 6$ c. $x = 8$ d. $x = 4$ e. No solution

$\log_2(x+2)4 = \log_2 32$

so $4(x+2) = 32$

$4x + 8 = 32$

$4x = 24$

$x = 6$

When you substitute $x = 6$ in the equation, all expressions are defined.

24. Solve the equation: $9^{(3x-12)} = (3)^{2x}$.

a. 12 b. -12 c. -6 d. 6 e. No solution

Equate the bases:

$(3^2)^{3x-12} = 3^{2x}$

$3^{2(3x-12)} = 3^{2x}$

$2(3x-12) = 2x$

$6x - 24 = 2x$

$-24 = -4x$

$x = 6$

25. Identify the asymptotes of the graph given by $\boldsymbol{h(x)} = \frac{\boldsymbol{x^2-25}}{\boldsymbol{x^2-16}}$

$= \frac{(x+5)(x-5)}{(x+4)(x-4)}$

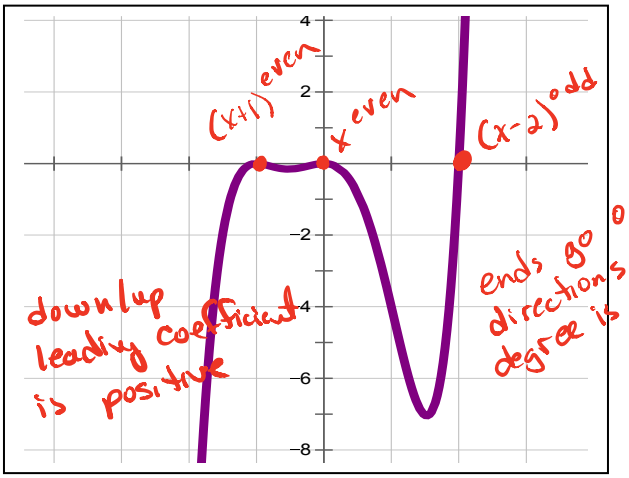
Recall: Vertical asymptotes are obtained from the factors in the denominator, so $x = -4$ and $x = 4$

a. Horizontal asymptote $y = 0$; Vertical asymptote $x = 5$.
b. Horizontal asymptote $y = 1$; Vertical asymptote $x = 5$.
c. Horizontal asymptote $y = 0$; Vertical asymptotes $x = 4$ and $x = -4$.
d. Horizontal asymptote $y = 1$; Vertical asymptotes $x = 4$ and $x = -4$.
e. None of the above are correct.

Recall horizontal asymptotes are determined by comparing the degree of the numerator and denominators. Both have degree 2, so the horizontal asymptote is (leading coefficient)/(leading coefficient) so $y = \frac{1}{1}$ or $y = 1$.

26. Which of the following equations could match the graph shown on the right?

a. $y = -x^2(x+1)^2(x-2)$
b. $y = x^2(x+1)^2(x-2)$
c. $y = x^2(x+1)(x-2)^2$
d. $y = -x^2(x+1)(x-2)^2$
e. None of these



27. Solve for x: $4^x = 5.7$.

a. $x = \ln(\frac{5.7}{4})$ b. $x = 1.255$ c. $x = \frac{\log 4}{\log 5.7}$ d. $x = \log_4 5.7$ e. $x = 0.702$

switch to log form OR Take log of each side

$x = \log_4 5.7$

$\log 4^x = \log 5.7$

$x \log 4 = \log 5.7$

$x = \frac{\log 5.7}{\log 4} = \log_4 5.7$ ← change of base

28. Which of the following is an ellipse with center $(4, -7)$?

a. $\frac{(x+4)^2}{9} - \frac{(y-7)^2}{16} = 1$ Hyperbola opens left/right; Center (-4,7)

b. $-\frac{(x+4)^2}{9} + \frac{(y-7)^2}{7} = 1$ Hyperbola opens up/down; center (-4,7)

c. $\frac{(x+4)^2}{9} + \frac{(y-7)^2}{49} = 1$ Ellipse Center (-4,7)

d. $\frac{(x-4)^2}{9} + \frac{(y+7)^2}{49} = 1$ Ellipse center (4,-7)

e. $(x + 4)^2 + (y - 7)^2 = 1$ Circle center (-4,7)

f. $y = (x - 4)^2 + 7$ Parabola opens up vertex (4,7)

g. $y = (x - 7)^2 + 4$ Parabola opens up vertex (7,4)

h. $x = (y - 4)^2 + 7$ Parabola opens right vertex (7,4)

i. $x = (y + 7)^2 + 4$ Parabola opens right vertex (4, -7)

j. None of these

29. Which of the following is a parabola opening right with a vertex of $(4, -7)$?

a. $\frac{(x+4)^2}{9} - \frac{(y-7)^2}{16} = 1$

b. $-\frac{(x+4)^2}{9} + \frac{(y-7)^2}{7} = 1$

c. $\frac{(x+4)^2}{9} + \frac{(y-7)^2}{49} = 1$

d. $\frac{(x-4)^2}{9} + \frac{(y+7)^2}{49} = 1$

e. $(x + 4)^2 + (y - 7)^2 = 1$

f. $y = (x - 4)^2 + 7$

g. $y = (x - 7)^2 + 4$

h. $x = (y - 4)^2 + 7$

i. $x = (y + 7)^2 + 4$

j. None of these

30. Which of the following is a hyperbola with branches opening left and right?

a. $\frac{(x+4)^2}{9} - \frac{(y-7)^2}{16} = 1$
b. $-\frac{(x+4)^2}{9} + \frac{(y-7)^2}{7} = 1$
c. $\frac{(x+4)^2}{9} + \frac{(y-7)^2}{49} = 1$
d. $\frac{(x-4)^2}{9} + \frac{(y+7)^2}{49} = 1$
e. $(x + 4)^2 + (y - 7)^2 = 1$
f. $y = (x - 4)^2 + 7$
g. $y = (x - 7)^2 + 4$
h. $x = (y - 4)^2 + 7$
i. $x = (y + 7)^2 + 4$
j. None of these

31. Solve $\log_x 8 = -\frac{1}{2}$.

a. -64
b. -16
c. $\frac{1}{64}$
d. 4
e. -4

Change to exponential

$x^{-1/2} = 8$

so $\left(x^{-1/2}\right)^{-2} = 8^{-2}$

$x = 8^{-2} = 1/8^2 = 1/64$

32. Solve the logarithmic equation: $\log_4(x-2) + \log_4(x-2) = 1$.

a. -4, 4
b. $\sqrt{5}$
c. 3
d. 4
e. None of these.

$\log_4(x-2)(x-2) = 1$

$4^1 = (x-2)(x-2)$

$4 = x^2 - 4x + 4$

$0 = x^2 - 4x$

$0 = x(x-4)$

$x = 0$ Does not check. $\log(0-2)$ is not defined

$x - 4 = 0$

$x = 4$ This does check.

33. Solve the exponential equation: $2^x = 22$.

a. 0.224
b. 2.398
c. 4.459
d. 11
e. -1.041

Change to log

$x = \log_2 22$

$x = \frac{\log 22}{\log 2} \approx 4.459$

OR

$\log 2^x = \log 22$

$x \log 2 = \log 22$

$x = \frac{\log 22}{\log 2} \approx 4.459$

34. Solve the logarithmic equation for x: $\log_a(x) = \log_a(4) + \log_a(8)$.

a. $\frac{1}{2}$
b. 2
c. 12
d. 32
e. None of these.

$\log_a x = \log_a 4 \cdot 8$

$\log_a x = \log_a 32$

$x = 32$

35. Select the description that fits the graph of the quadratic function $y = x^2 - 10x + 24$.

a. y-intercept $(0,24)$ and vertex of $(5,-1)$.
b. y -intercept $(24,0)$ and vertex of $(5,-1)$.
c. y -intercept $(0,24)$ and vertex of $(-5,-1)$.
d. y -intercept $(24,0)$ and vertex of $(-5,-1)$.
e. None of these

Let $x=0$
y-intercept $= (0,24)$
vertex $x = \frac{-b}{2a} = \frac{-(-10)}{2(1)} = 5$
$y = 5^2 - 10(5) + 24 = -1$
$(5,-1)$

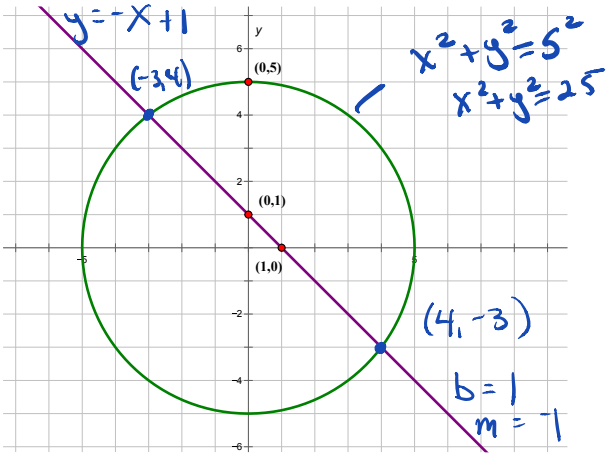
36. Identify the description that fits the graph of $h(x) = (x+4)^2(x-3)^3(x-1)^4$.

a. Crosses the x-axis at $(4,0)$ and $(-1,0)$ and bounces off the x -axis at $(-3,0)$.
b. Crosses the x -axis at $(-3,0)$ and bounces off the x -axis at $(4,0)$ and $(-1,0)$.
c. Crosses the x -axis at $(-4,0)$ and $(1,0)$ and bounces off the x -axis at $(3,0)$.
d. Crosses the x -axis at $(3,0)$ and bounces off the x -axis at $(-4,0)$ and $(1,0)$.
e. Crosses the x -axis at $(3,0)$ and $(-1,0)$ and bounces off the x -axis at $(-4,0)$.

Zeros	-4	3	1
multiplicity	2	3	4
	B	C	B

37. Which system of equations would result in the following graph and what are the solutions to the system of equations?

Note: There is a mistake in this problem. The correct answer is b if the coordinates of one point are changed.



a. $\begin{cases} x^2 + y^2 = 5 \\ y = -x + 1 \end{cases}$, with solutions $(3,-4)$ and $(-3,4)$
b. $\begin{cases} x^2 + y^2 = 25 \\ y = -x + 1 \end{cases}$, with solutions $(4,-3)$ and $(-3,4)$
c. $\begin{cases} y = x^2 + 25 \\ y = -x - 1 \end{cases}$, with solutions $(3,-4)$ and $(-3,4)$
d. $\begin{cases} y = -x^2 - 5 \\ y = -x - 1 \end{cases}$, with solutions $(3,-4)$ and $(-3,4)$
e. $\begin{cases} x^2 + y^2 = 25 \\ y = x + 1 \end{cases}$, with solutions $(3,-4)$ and $(-3,4)$

38. Find the exact value, in simplified form, of the distance between $(3,-7)$ and $(6,2)$.

a. $\sqrt{34}$
b. $\sqrt{90}$
c. $3\sqrt{10}$
d. $9\sqrt{2}$
e. $\sqrt{106}$

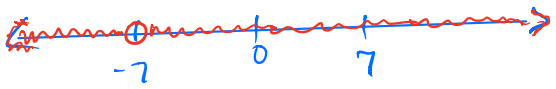
$d = \sqrt{(3-6)^2 + (-7-2)^2}$
$= \sqrt{(-3)^2 + (-9)^2}$
$= \sqrt{9+81} = \sqrt{90}$ (not simplified)
$= \sqrt{9}\sqrt{10} = 3\sqrt{10}$

Recall the denominator of a fraction cannot equal zero.

39. Select the domain of $f(x) = \frac{(x+2)(x-4)}{x+7}$.

a. $(-\infty, 7)$
b. $(-\infty, -2) \cup (-2,4) \cup (4, \infty)$
c. $(7, \infty)$
d. $(-\infty, 7) \cup (7, \infty)$
e. $(-\infty, -7) \cup (-7, \infty)$

So $x + 7 \neq 0$
$x = -7$

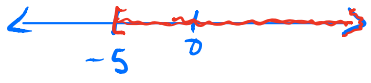


Recall the amount under the square root must be zero or greater.

40. What is the domain of $f(x) = \sqrt{x+5}$

a. $(-\infty, -5)$
b. $(-\infty, -5]$
c. $(-5, \infty)$
d. $[-5. \infty)$
e. $(-\infty, -5) \cup (-5, \infty)$

So $x + 5 \geq 0$
$x \geq -5$
$[-5, \infty)$



Note the x^3 term is missing so put in a "filler" 0.

41. When $5x^4 + 3x^2 - 4x - 7$ is divided by $x + 2$ the result is:

a. $5x^3 + 13x + 22 - \frac{37}{x+2}$
b. $5x^3 - 13x^2 + 22x - 37$
c. $5x^3 + 10x^2 + 23x + 42 + \frac{77}{x+2}$
d. $5x^3 - 10x^2 + 23x - 50 + \frac{93}{x+2}$
e. None of the above

-2 | 5 0 3 −4 −7

	−10	20	−46	100
5	−10	23	−50	93
x^3	x^2	x	constant	remainder

$5x^3 - 10x^2 + 23x - 50 + \frac{93}{x+2}$

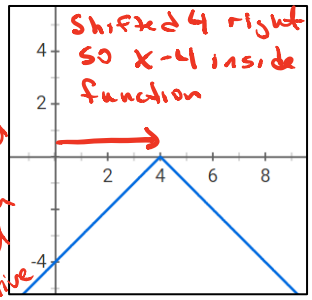
42. Which of the following is the correct standard form of the equation $x^2 + 6x + y^2 - 4y - 10 = 0$?

a. $(x+3)^2 + (y-2)^2 = 10$
b. $(x-3)^2 + (y+2)^2 = 10$
c. $(x+3)^2 + (y-2)^2 = 23$
d. $(x-3)^2 + (y+2)^2 = 23$
e. None of the above

$(x^2+6x+9) + (y^2-4y+4) = 10+9+4$
$(x+3)^2 + (y-2)^2 = 23$
Note this is a circle with center $= (-3, 2)$ and radius $= \sqrt{23}$.

43. Which formula correctly corresponds to the given graph?

a. $y = |-x| - 4$
b. $y = |-x| + 4$
c. $y = -|x+4|$
d. $y = -|x-4|$
e. $y = |-x+4|$



Shifted 4 right so $x-4$ inside function

Graph is reflected over the x-axis so the function is multiplied by a negative

shifted down 0

Note: You could also substitute values for some specific points to check further.