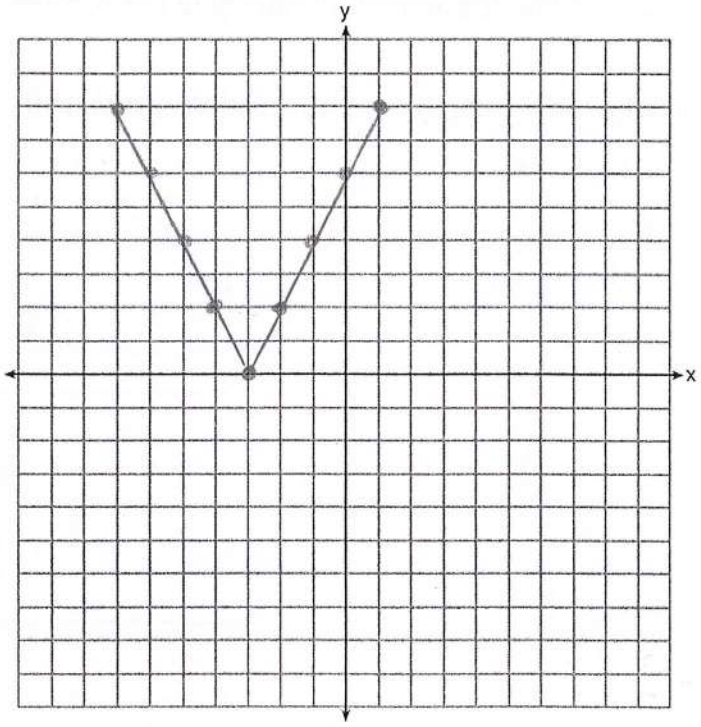
Name: Answer Key
Math 412- Ms. Castellano

Date: _____
Quarter 3 Review

Show all work to receive full credit.

1. On the set of axes below, graph $y = 2|x + 3|$. Include the interval $-7 \leq x \leq 1$.

left 3
stretched by 2



2. The height, h, in feet, a ball will reach when thrown in the air is a function of time, t, in seconds, given by the equation $h(t) = -16t^2 + 30t + 6$. Find, to the *nearest tenth*, the maximum height, in feet, the ball will reach.

$t = \frac{-30}{2(-16)} = .9375$

$-16(.9375)^2 + 30(.9375) + 6$

$h(.9375) =$ **20.1 ft**

3. Solve $x^3 + 5x^2 = 4x + 20$ algebraically.

$x^3 + 5x^2 - 4x - 20 = 0$

$x^2(x+5) - 4(x+5) = 0$

$(x^2 - 4)(x+5) = 0$

$(x+2)(x-2)(x+5) = 0$

$x = -2$ **$x = 2$** **$x = -5$**

4. Some banks charge a fee on savings accounts that are left inactive for an extended period of time. The equation $y = 5000(0.98)^x$ represents the value, y, of one account that was left inactive for a period of x years. What is the y-intercept of this equation and what does it represent?

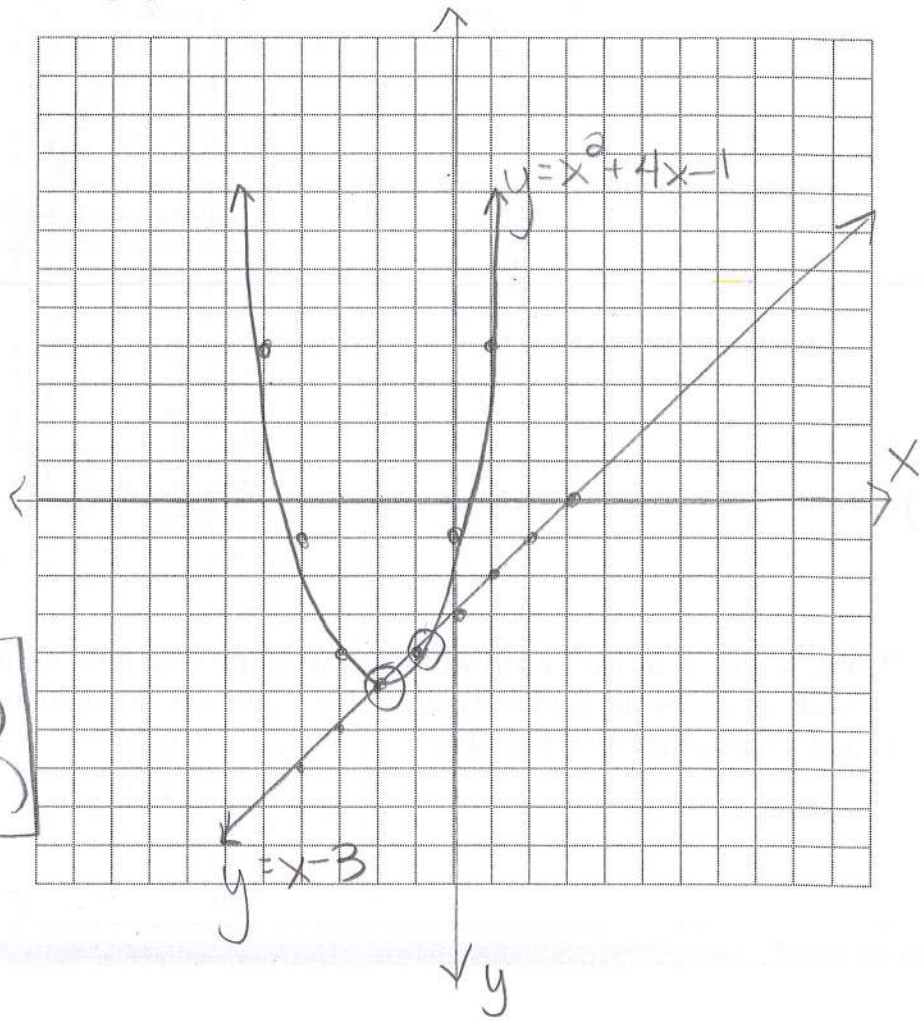
(1) 0.98, the percent of money in the account initially
(2) 0.98, the percent of money in the account after x years
(3) 5000, the amount of money in the account initially
(4) 5000, the amount of money in the account after x years

5. Solve the following system of equations graphically:

$y = x^2 + 4x - 1$
$y + 3 = x$

$y = x - 3$

x	y
-5	4
-4	-1
-3	-4
-2	-5
-1	-4
0	-1
1	4



(-1, -4)
(-2, 5)

6. Solve $2x^2 - 12x + 4 = 0$ by completing the square, expressing the result in simplest radical form.

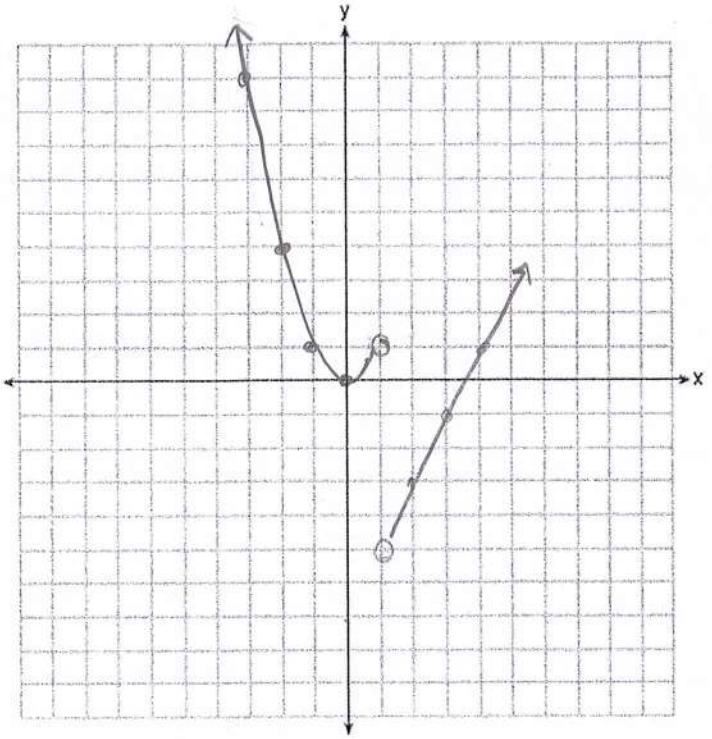
$x^2 - 6x + 2 = 0$
$x^2 - 6x + 9 + 2 - 9 = 0$
$(x-3)^2 = \sqrt{7}$
$x - 3 = \pm\sqrt{7}$
$x = 3 \pm \sqrt{7}$

7. Graph: $f(x) = \begin{cases} x^2, x < 1 \\ 2x - 7, x > 1 \end{cases}$

x^2

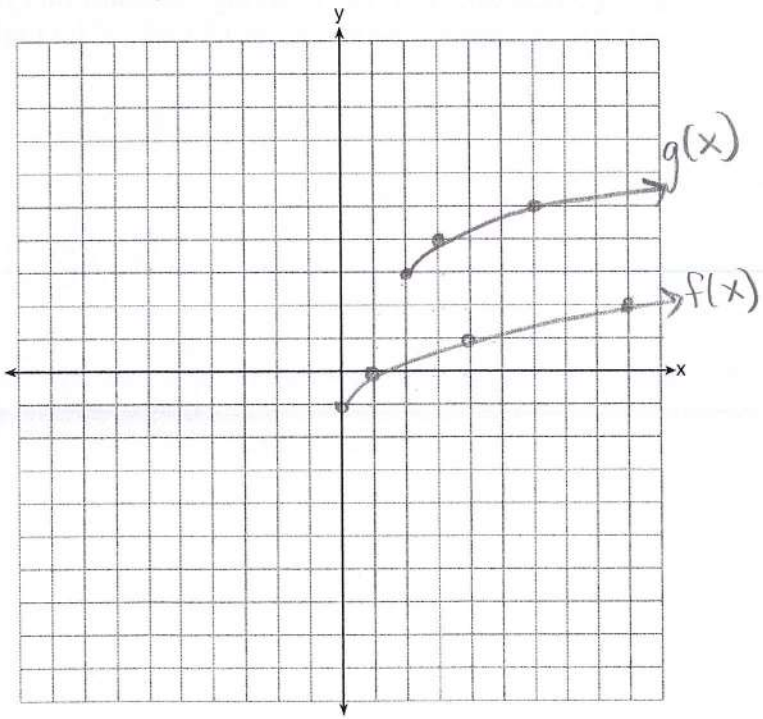
x	y
1	1
0	0
-1	1
-2	4
-3	9

x	y
1	-5
2	-3
3	-1
4	1
5	3



8. Draw the graph of $f(x) = \sqrt{x} - 1$ on the set of axes below.

x	y
0	-1
1	0
4	1
9	2

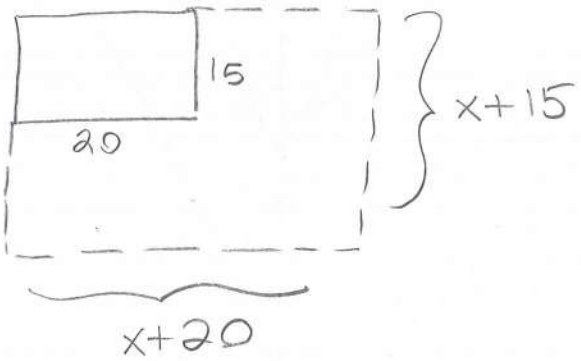


(a) Identify the domain and range of the function. D: $[0, \infty)$

R: $[-1, \infty)$

(b) Graph and label the function $g(x)$ on the same set of axes if $g(x) = f(x - 2) + 4$.

9. A homeowner wants to increase the size of a rectangular deck that now measures 15 feet by 20 feet, but building code laws state that a homeowner cannot have a deck larger than 900 square feet. If the length and the width are to be increased by the same amount, find, to the *nearest tenth*, the maximum number of feet that the length of the deck may be increased in size legally.



$(x+15)(x+20) \leq 900$

$x^2+35x-600 \leq 0$

$x = \frac{-35 \pm \sqrt{35^2-4(1)(-600)}}{2(1)}$

$x = \frac{-35 \pm \sqrt{3625}}{2} = \frac{-35 \pm 60.2}{2}$

$\boxed{12.6}$ $\quad -47.6$

10. Joe deposits \$50 into a savings account that pays 3.25% interest compounded quarterly. What will his investment be worth in 12 years if he makes no other deposits or withdrawals?

$A = 50\left(1+\frac{.0325}{4}\right)^{2(4)}$

$A = 50(1.008125)^{48}$

$\boxed{\$73.73}$

11. The length of a rectangle is 7 units more than its width. If the width is doubled and the length is increased by 2, the area is increased by 42 square units. Use an algebraic solution to find the dimensions of the original rectangle.

$x(x+7)+42=2x(x+9)$
$x^2+7x+42=2x^2+18x$
$0=x^2+11x-42$
$0=(x+14)(x-3)$
$x\neq -14$
$x=3$

3 by 10

12. Which of the following systems of equations has many solutions?

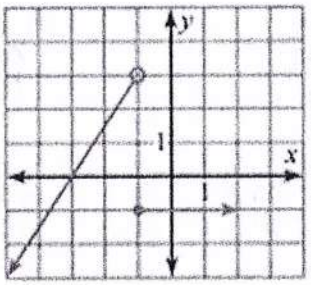
(1) $2x+3y=6$
$y=2x+2$
$3y=-2x+6$
$y=-\frac{2}{3}x+2$
same line

(2) $8x-4y=12$
$y=2x-3$
$-4y=-8x+12$
$y=2x-3$

(3) $y=4x+3$
$y=4x-3$

(4) $2x+y=4$
$-2x-y=4$

13. Write the equation of the piecewise function graphed below.



$f(x)=\begin{cases}\frac{3}{2}x+\frac{9}{2}, & x<-1\\ -1, & x\geq -1\end{cases}$

14. What is the domain of the function: $f(x)=\sqrt{x-2}+3$?

(1) $(-\infty,\infty)$
(2) $(2,\infty)$
(3) $[2,\infty)$
(4) $[3,\infty)$

15. Which set of ordered pairs does *not* represent a function?

(1) {(3,-2), (-2,3), (4,-1), (-1,4)}
(2) {(3,-2), (3,-4), (4,-1), (4,-3)}
(3) {(3,-2), (4,-3), (5,-4), (6,-5)}
(4) {(3,-2), (5,-2), (4,-2), (-1,-2)}

16. Which is a true statement about the graph of the equation $y = x^2 - 7x - 60$?

$$\frac{7 \pm \sqrt{(-7)^2 - 4(1)(-60)}}{2(1)}$$

(1) It is tangent (touches only once) to the x-axis.
(2) It does not intersect the x-axis.
(3) It intersects the x-axis in two distinct points that have irrational coordinates.
(4) It intersects the x-axis in two distinct points that have rational coordinates.

12 and -5

$$\frac{7 \pm \sqrt{289}}{2} \rightarrow \frac{7+17}{2}, \quad \frac{7-17}{2}$$

17. What is the solution set of the equation $|x^2 - 2x| = 3x - 6$?

$x^2 - 2x = 3x - 6$
$x^2 - 5x + 6 = 0$
$(x-3)(x-2) = 0$
$x = 3$ $x = 2$

$|3^2 - 6| = 9 - 6$
$3 = 3$ ✓

$x^2 - 2x = -3x + 6$
$x^2 + x - 6 = 0$
$(x+3)(x-2) = 0$
$x \neq -3$ $x = 2$
reject repeat

$|2^2 - 4| = 3(2) - 6$
$0 = 0$

$|9 + 6| \neq -15$

18. The height, f(x), of a bouncing ball after x bounces is represented by $f(x) = 80(0.5)^x$. How many times higher is the first bounce than the fourth bounce?

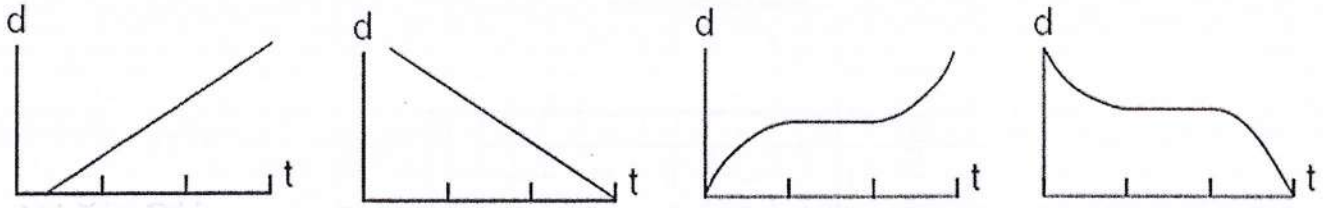
(1) 8
(2) 2
(3) 16
(4) 4

$f(4) = 80(.5)^4 = 5$

$f(1) = 80(.5)^1 = 40$

$5 \cdot (8) = 40$

19. A bug travels up a tree, from the ground, over a 30-second interval. It travels fast at first and then slows down. It stops for 10 seconds, then proceeds slowly, speeding up as it goes. Which sketch best illustrates the bug's distance (d) from the ground over the 30-second interval (t)?



(1) (2) (3) (4)

20. The tickets for a dance recital cost \$5.00 for adults and \$2.00 for children. If the total number of tickets sold was 295 and the total amount collected was \$1,220, how many adult tickets were sold?

$5a + 2c = 1220$
$a + c = 295$

$a = \boxed{210}$

$5a + 2c = 1220$
$-2a - 2c = -590$

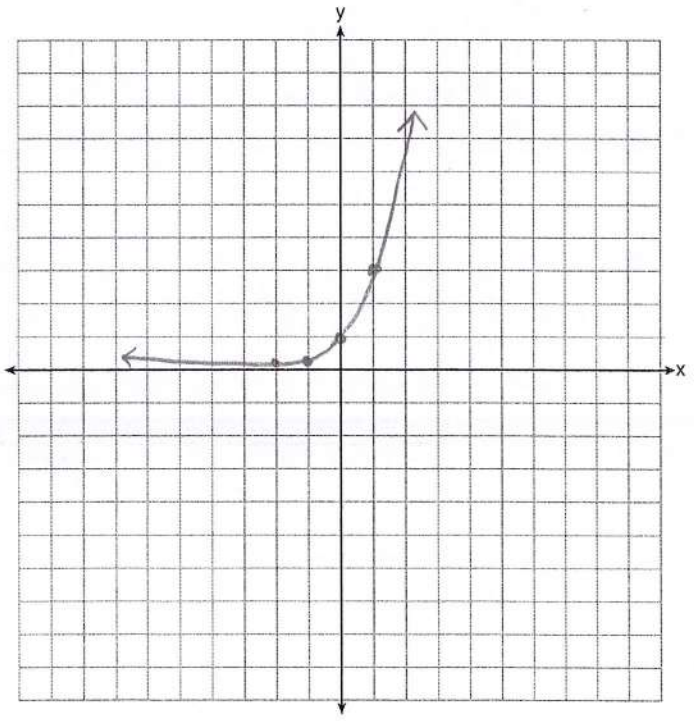
$\frac{3a}{3} = \frac{630}{3}$

21. Which function is shown in the table below?

(1) $f(x) = 3x$
(2) $f(x) = x + 3$
(3) $f(x) = -x^3$
(4) $f(x) = 3^x$

x	$f(x)$
-2	$\frac{1}{9}$
-1	$\frac{1}{3}$
0	1
1	3

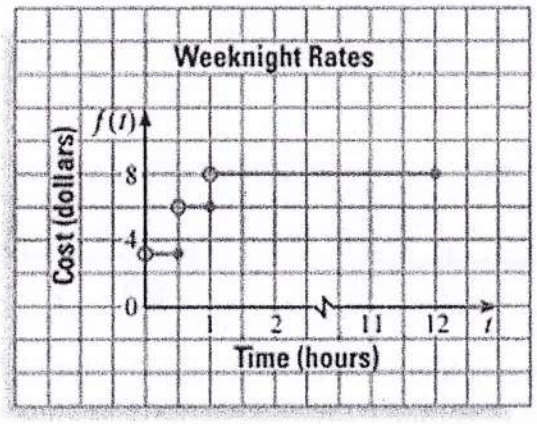
Graph the function.



Write the equation of the asymptote.

$\boxed{y = 0}$

23. Write the equation of the step function graphed below.



$$f(x)=\begin{cases}3, 0<x\le 0.5\\ 6, 0.5<x\le 1\\ 8, 1<x\le 12\end{cases}$$

24. Which of the following equations represents the function $f(x)$ obtained by reflecting the function $g(x)=\sqrt{x}$ over the x-axis, then a vertical shift up 3 units, and then a dilation of 2?

(1) $f(x)=-2\sqrt{x}+6$

(2) $f(x)=-2\sqrt{x}+3$

(3) $f(x)=2\sqrt{-x}+6$

(4) $f(x)=2\sqrt{-x}+3$

25. $f(x)=\begin{cases}-x+1 & x\le 0\\ \frac{-4}{3}x-4 & x>0\end{cases}$

Find: $f(-6)=$ 7 $\quad f(0)=$ 1 $\quad f(12)=$ -20

$-(-6)+1$

$-(0)+1$

$-\frac{4}{3}(12)-4$

$-16-4$