Target 1.A. Identify whether a relation, given a graph or table, is a function.

1. Determine if the following tables are functions or not functions.

a.

x	y
2	0
2	2
2	4
2	6

No

b.

x	y
1	3
1	4
1	2
1	4

No

c.

x	y
5	1
4	2
4	3
5	4

No

d.

x	y
1	1
2	2
3	−1
4	−2

yes

e.

x	y
0	1
2	3
4	5
6	7

yes

Target 1.B. Using function notation, evaluate a function for a given x-value.

Evaluate the function for the given value.

2. If $f(x) = \frac{1}{2}x - 8$, find the value of $f(4)$. $\boxed{-6}$

Target 1.C. Rearrange formulas to highlight a quantity of interest, using the same reasoning as solving equations.

3. Solve the volume formula, $V = lwh$, for w.

$$\frac{V}{lh} = \frac{lwh}{lh}$$

$$\boxed{w = \frac{V}{l \cdot h}}$$

4. Solve the perimeter formula, $P = 2l + 2w$, for l.

$$\frac{-2w \qquad -2w}{}$$

$$\frac{P - 2w}{2} = \frac{2l}{2}$$

$$l = \frac{P - 2w}{2} \quad or \quad \boxed{\frac{1}{2}P - w}$$

Target 1.D. Find and graph the inverse of a linear function.

5. Find the inverse of $f(x) = 3x - 8$.

$$x = 3f(x) - 8$$
$$\frac{+8 \qquad\qquad +8}{}$$
$$\frac{x + 8}{3} = \frac{3f(x)}{3}$$
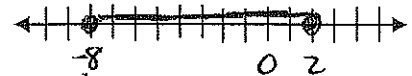
$$\boxed{f^{-1}(x) = \frac{x + 8}{3}}$$

Target 2.A. Utilize a graph to illustrate the solution set of an absolute value inequality.

6. Solve and graph of the solution to this inequality: $|x + 3| \le 5$

$$x + 3 \le 5 \quad AND \quad x + 3 \ge -5$$
$$x \le 2 \quad AND \quad x \ge -8$$
$$-8 \le x \le 2$$

Target 2.B. Understand the relationship between an equation and its graph

slope $= -2$
Vertex $(0, 4)$
opp' same

7. Which function is shown?

a. $y = 2|x + 4|$ $\boxed{D}$
b. $y = -2|x - 4|$
c. $y = -2|x + 4|$
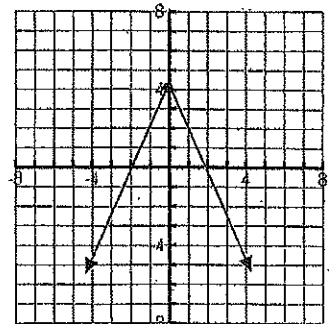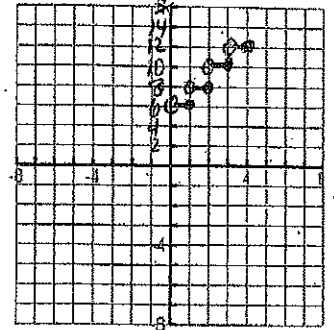d. $y = -2|x| + 4$
e. $y = 2|x| + 4$

$$y = -2|x + 0| + 4$$

8. Fedex uses the weight of a package to determine the charge for delivery. The charge is $6 for the first pound (or any fraction thereof) and $2 for each additional pound (or fraction thereof) up to 10 pounds.

If C(x) is the charge for delivering a package weighing x pounds, then

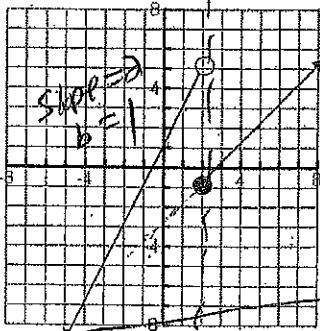$$C(x) = \begin{cases} 6 \text{ for } 0 < x \le 1 \\ 8 \text{ for } 1 < x \le 2 \\ 10 \text{ for } 2 < x \le 3 \\ 12 \text{ for } 3 < x \le 4 \end{cases}$$
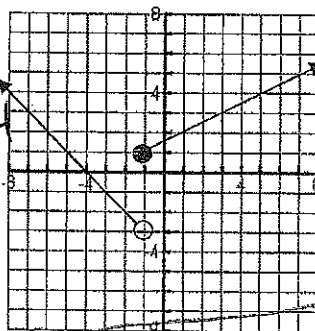
space by 2's

and so on. Sketch the correct graph of C(x) for $0 < x \le 4$

9. Write the equation for each piecewise function.

slope = 1
b = -3
slope = 2
b = 1

$$f(x) = \begin{cases} x - 3 \text{ if } x \ge 2 \\ 2x + 1 \text{ if } x < 2 \end{cases}$$

m = -1
b = -4
m = ½ b = 1.5

$$f(x) = \begin{cases} \frac{1}{2}x + 1.5 \text{ if } x \ge -1 \\ -x - 4 \text{ if } x < -1 \end{cases}$$

Target 3.A. Translate a verbal model into an algebraic model.

10. Write a systems of equations that correctly model the situation. DO NOT SOLVE. You sold 48 boxes of candy for the math club fundraiser. The large size box costs $2.50 and the small size box costs $0.75 each. You sold $88.50 worth of candy. Let x equal the number of large boxes of candy sold and let y equal the number of small boxes of candy sold.
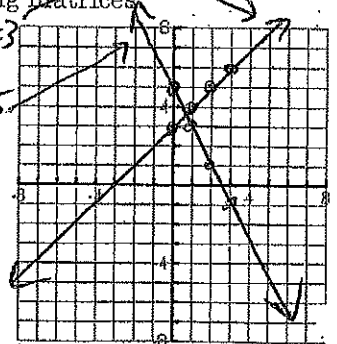
boxes → $x + y = 48$

money → $2.50x + 0.75y = 88.50$

Target 3.B. Solve a system of equations graphically, algebraically and using matrices.

11. Graph the solution to the following linear system.
$y = x + 3$　$m = \frac{1}{1}$ $b = 3$
$y = -2x + 5$
$m = \frac{-2}{1}$ $b = 5$

12. Solve the following system of equations:　$y = 4x + 1$
$4x - 3y = -27$

$4x - 3(4x + 1) = -27$
$4x - 12x - 3 = -27$
$ +3 \quad +3$
$-8x = -24$
$x = 3$

$y = 4(3) + 1 = 13$

$(3, 13)$

13. Solve the following system of equations:

$$-3x + 4y = -10$$
$$5x + 4y = 6$$

$$-3x + 4y = -10$$
$$-5x - 4y = -6$$
$$\overline{-8x = -16}$$
$$x = 2$$

$$5(2) + 4y = 6$$
$$4y = -4$$
$$y = -1$$

$$(2, -1)$$

14. You are selling tickets for a high school football game. Student tickets cost $2 and general admission tickets cost $4. You sell 250 tickets and collect $700. Determine how many tickets of each are sold.

$$x = student = 150$$
$$y = GA = 100$$

$$x + y = 250 \rightarrow -2x - 2y = -500$$
$$2x + 4y = 700 \rightarrow 2x + 4y = 700$$
$$\overline{2y = 200}$$
$$y = 100, \; x = 150$$

Target 3.C. Understand the relationship between a system of equations and its number of solutions.

15. How many solutions does the following sysytem of equations have?

$$-x - 5y = 3 \rightarrow -4x - 20y = 12$$
$$4x + 20y = 24 \rightarrow 4x + 20y = 24$$
$$0 = 36$$

$$\boxed{\text{no solutions}} \quad \longleftarrow$$
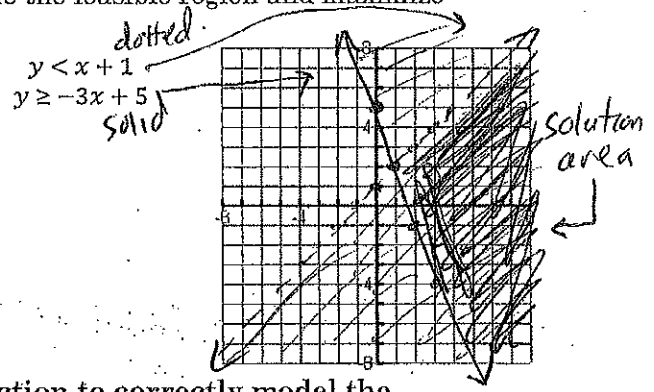
Target 3.D. Graph a system of inequalities to determine the feasible region and maximize or minimize an objective function.

16. Graph the solution to the systems of inequalities.

$$y < x + 1 \quad \text{dotted}$$
$$y \geq -3x + 5 \quad \text{solid}$$

$$(0, 0) \quad y < x + 1$$
$$0 < 1 \quad \text{true}$$

$$(0, 0) \quad y \geq -3x + 5$$
$$0 \geq 5 \quad \text{False}$$

solution area

Target 3.E. Problem solve using Linear Programming.

17. Write the list of constraints and objective function to correctly model the situation. DO NOT SOLVE. Juan's bakery can produce either donuts or muffins. In a given day, the bakery can turn out at most 800 items, of which at least 300 donuts (d) and at least 250 muffins (m) are required by regular customers. The profit on a donut is $6 and on a muffin is $5.

$$d + m \leq 800$$
$$d \geq 300$$
$$m \geq 250$$

$$P = 6d + 5m$$

18. A feasible region has vertices at (0,0), (6, 0), (7, 7) and (0, 9). Find the point that maximizes the function $C = x + 4y$ over this region.

$$(0, 0) = 0$$
$$(6, 0) = 6$$
$$(7, 7) = 35$$
$$\boxed{(0, 9) = 36} \text{ max}$$

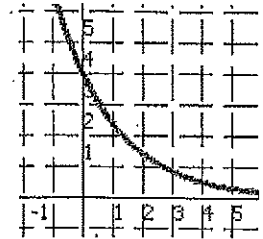**Target 4.A.** Understand the relationships between exponential functions and their graphs.

19. Select the function that best represents the growth curve shown in the graph below:

decay
a. $y = 20(1.2)^{-t}$ — decay
c. $y = 20(1.2)^t$
b. $y = 35(1.1)^{-t}$
d. $y = 35(1.1)^t$ — wrong y-int
e. $y = 20(.9)^t$ — decay

growth
y-int = 20
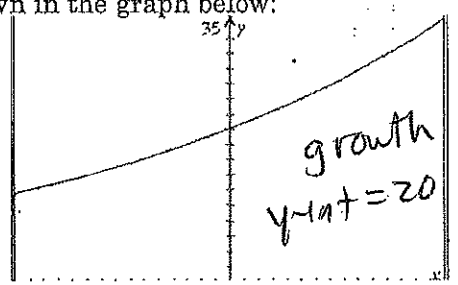
Use the graph below for problems 20-21.

20. Which type of function is represented by this graph?

$$\text{exponential decay}$$

21. What are the domain and range of the graphed function?

$$D: \text{all real } \#\text{'s}$$

$$R: \{y \mid y > 0\}$$

Target 4.B. Model and evaluate applications involving exponential growth and decay.

22. Back in 2010, a Nintendo Wii gaming system cost $350. Each year (t) since 2010, the cost (C) of the Wii *decreases* by 10%. Write an ~~exponential function~~ to describe the situation.

$$r = 1 - .10 = .9 \qquad \boxed{y = 350(.9)^t}$$

23. $5000 is deposited in a bank account that earns 6% annual interest, compounded quarterly.

$$n = 4$$

Use the formula $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$ to find the account balance at the end of seven years.

$$= 5000\left(1 + \frac{.06}{4}\right)^{4 \cdot 7} = \boxed{7586.11}$$

24. $700 is deposited in a bank account that pays 4% annual interest, compounded continuously.

Use the formula $A = Pe^{rt}$, to find the balance in the account after 6 years.

$$= 700\, e^{(.04)(6)} = \boxed{889.87}$$

Target 4.C. Understand how to move between exponential and logarithmic forms

25. Rewrite in exponential form: $\log_7 x = y$

$$\boxed{7^y = x}$$

26. Rewrite in logarithmic form: $8^y = x$

$$\boxed{\log_8 x = y}$$

Target 4.D. Simplify logarithmic expressions.

27. Evaluate: $\log_3 39$

$$3^x = 39 \qquad x = \frac{\log 39}{\log 3} \boxed{3.3347}$$

28. Evaluate: $\log_8 48$

$$8^x = 48 \qquad x = \frac{\log 48}{\log 8}$$

$$\boxed{x = 1.8617}$$

Target 4.E. Solve exponential and logarithmic equations.

29. Solve the equation: $\dfrac{4e^x}{4} - \dfrac{3}{+3} = \dfrac{9}{+3}$

$$e^x = 3 \qquad x = \ln 3 = \boxed{1.0986}$$

30. Solve the equation: $\log_3(2x + 16) = \log_3(6x - 36)$

$$\begin{array}{cc} -2x + 36 & -2x + 36 \end{array}$$

$$\frac{52}{4} = \frac{4x}{4} \qquad \boxed{x = 13}$$

Target 4.F. Condense and expand logarithms using logarithmic properties.

31. Expand: $\log \dfrac{x^4 y^2}{z^5}$

$$\log x^4 y^2 - \log z^5$$

$$= \boxed{(4\log x + 2\log y) - 5\log z}$$

32. Condense: $7\log x - \log 3$

$$\boxed{\log \frac{x^7}{3}}$$

Target 5.A. Add, subtract and multiply complex numbers

For problems 33-40: Simplify, then write the expression as a complex number in standard form.

33. $\sqrt{-48}$

$= \sqrt{-1} \cdot (2 \cdot 2) \cdot 2 \cdot 3$

$= \boxed{4i\sqrt{3}}$

34. $(7 + 4i) + (11 - 2i)$

$\boxed{18 + 2i}$

35. $(2 - 5i) - (6 + 8i)$

$-6 - 8i$

$\boxed{-4 - 13i}$

36. $(4i)^3$

$(4i)(4i)(4i)$

$64i^3 = \boxed{-64i}$

$(-i)$

37. $4i(1 + 6i)$

$4i + 24i^2$

(-1)

$= \boxed{-24 + 4i}$

38. $(2 + 4i)(3 - 7i)$

$6 - 14i + 12i - 28i^2$

(-1)

$+28$

$= \boxed{34 - 2i}$

Target 5.B. Solve quadratic equations graphically and algebraically

39. What are the solutions to the following quadratic equation: $3x^2 - x - 4 = 0$

	3	-4
3	3	
1		-4

-1

$(3x - 4)(x + 1) = 0$

$\boxed{x = \frac{4}{3} \quad x = -1}$

Target 5.C. Use the discriminant to determine the number and type of roots and verify by graphing.

40. Find the value of the discriminant: $-3x^2 - 12x + 6 = 0$

$\begin{array}{cccc} a & b & c & b^2 - 4ac \end{array}$

$(-12)^2 - 4(-3)(6)$

$144 + 72 = \boxed{216}$

41. Describe the number and type of roots of a quadratic equation if the value of the discriminant is less than zero.

$2 \text{ complex solutions}$

Target 5.D. Solve quadratic equations with complex solutions

$a = 1 \quad b = -1 \quad c = 16$

42. Use the quadratic formula, $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, to find all of the solutions of $x^2 - x + 16 = 0$

$b^2 - 4ac$

$(-1)^2 - 4(1)(16)$

$1 - 64 = -63$

$x = \dfrac{1 \pm \sqrt{-63}}{2} = \dfrac{1 \pm 3i\sqrt{7}}{2} = \boxed{\dfrac{1}{2} + \dfrac{3i\sqrt{7}}{2}}$

Target 5.E. Write a quadratic equation in $y = ax^2 + bx + c$ form given its roots.

43. Given the roots $x = -6$ and $x = 7$, write the correct quadratic in the form $y = ax^2 + bx + c$.

$(x + 6)(x - 7)$ FOIL

$x^2 - 7x + 6x - 42$

$\boxed{y = x^2 - x - 42}$