Student Name: _____	Contact Person Name: _____
Date: _____	Phone Number: _____

Texas Assessment of Knowledge and Skills

Exit Level Math Review

Lesson 3

Analyzing Tables and Graphs of Functions

TAKS Objective 1 – Describe functional relationships in a variety of ways

Lesson Objectives:

- Determine if a function corresponds to a given table or graph
- Determine if a function corresponds to a given graph
- Determine solutions to a function

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The Texas Assessment of Knowledge and Skills (TAKS) exit level exam covers ten learning objectives. These lessons are designed to teach math concepts specific to each objective as well as strategies to consider when approaching typical TAKS questions. To successfully complete the TAKS exit level exam, the student should be able to:

1) **Describe functional relationships in a variety of ways.**
2) **Demonstrate an understanding of the properties and attributes of functions.**
3) **Demonstrate an understanding of linear functions.**
4) **Formulate and use linear equations and inequalities.**
5) **Demonstrate an understanding of quadratic equations and other nonlinear functions.**
6) **Demonstrate an understanding of geometric relationships and spatial reasoning.**
7) **Demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.**
8) **Demonstrate an understanding of concepts and uses of measurement and similarity.**
9) **Demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.**
10) **Demonstrate an understanding of the mathematical processes and tools used in problem solving.**

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Developed by the National PASS Center under the leadership of the National PASS Coordinating Committee with funding from the Region 20 Education Service Center, San Antonio, Texas, as part of the Mathematics Achievement = Success (MAS) Migrant Education Program Consortium Incentive project.

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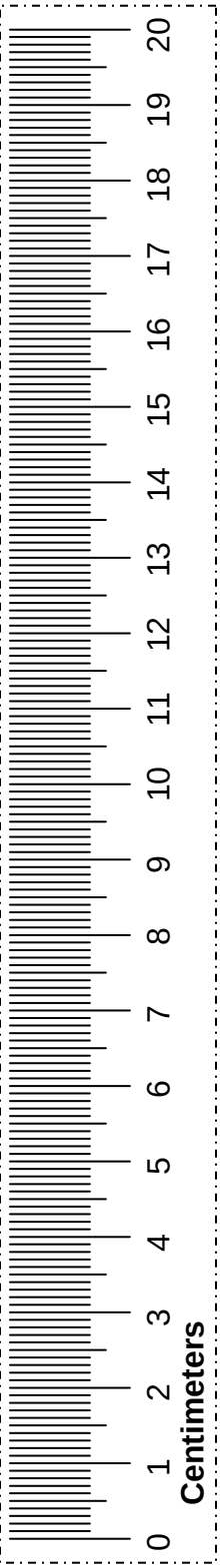
TAKS Mathematics Chart



Length

Metric	Customary
1 kilometer = 1000 meters	1 mile = 1760 yards
1 meter = 100 centimeters	1 mile = 5280 feet
1 centimeter = 10 millimeters	1 yard = 3 feet
	1 foot = 12 inches

Capacity and Volume

Metric	Customary
1 liter = 1000 milliliters	1 gallon = 4 quarts
	1 gallon = 128 fluid ounces
	1 quart = 2 pints
	1 pint = 2 cups
	1 cup = 8 fluid ounces

Mass and Weight

Metric	Customary
1 kilogram = 1000 grams	1 ton = 2000 pounds
1 gram = 1000 milligrams	1 pound = 16 ounces

Time

1 year = 365 days

1 year = 12 months

1 year = 52 weeks

1 week = 7 days

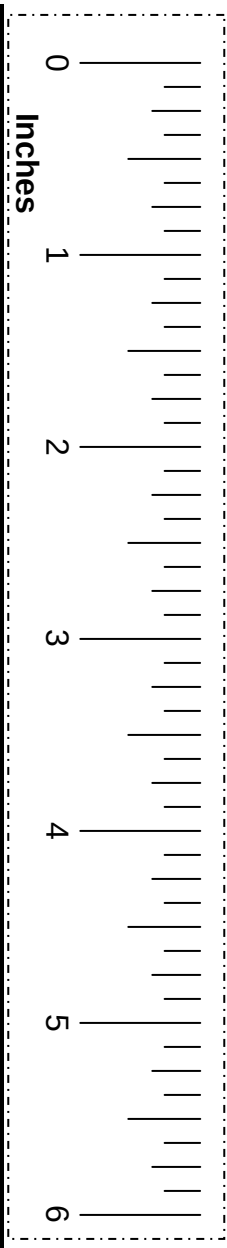
1 day = 24 hours

1 hour = 60 minutes

1 minute = 60 seconds

TAKS Mathematics Chart

Perimeter	Rectangle	$P = 2l + 2w$ or $P = 2(l + w)$
Circumference	Circle	$C = 2\pi r$ or $C = \pi d$
Area	Rectangle	$A = lw$ or $A = bh$
	Triangle	$A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$
	Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$ or $A = \frac{(b_1+b_2)h}{2}$
	Regular polygon	$A = \frac{1}{2}aP$
	Circle	$A = \pi r^2$
P represents the perimeter of the base of a three-dimensional figure.		
B represents the area of the base of a three-dimensional figure.		
Surface Area	Cube (total)	$S = 6s^2$
	Prism (lateral)	$S = Ph$
	Prism (total)	$S = Ph + 2B$
	Pyramid (lateral)	$S = \frac{1}{2}Pl$
	Pyramid (total)	$S = \frac{1}{2}Pl + B$
	Cylinder (lateral)	$S = 2\pi rh$
	Cylinder (total)	$S = 2\pi rh + 2\pi r^2$ or $S = 2\pi r(h + r)$
	Cone (lateral)	$S = \pi rl$
	Cone (total)	$S = \pi rl + \pi r^2$ or $S = \pi r(l + r)$
	Sphere	$S = 4\pi r^2$
Volume	Prism or Cylinder	$V = Bh$
	Pyramid or Cone	$V = \frac{1}{3}Bh$
	Sphere	$V = \frac{4}{3}\pi r^3$
Special Right Triangles	30°, 60°, 90°	$x,\ x\sqrt{3},\ 2x$
	45°, 45°, 90°	$x,\ x,\ x\sqrt{2}$
Pythagorean Theorem		$a^2 + b^2 = c^2$
Distance Formula		$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Slope of a Line		$m = \frac{y_2 - y_1}{x_2 - x_1}$
Midpoint Formula		$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
Quadratic Formula		$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Slope-Intercept Form of an Equation		$y = mx + b$
Point-Slope Form of an Equation		$y - y_1 = m(x - x_1)$
Standard Form of an Equation		$Ax + By = C$
Simple Interest Formula		$I = prt$



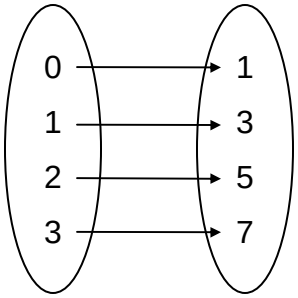
Think Back

A function can be represented by a table or a graph.

We have already shown how lists, tables, and mappings can represent the same function.

$\{(0,1),(1,3),(2,5),(3,7)\}$

x	y
0	1
1	3
2	5
3	7



In the example above, each x-value corresponds to the same y-value, which means all three represent the same function. What we have not discussed is how these three representations are related to equations and graphs.

Consider the equation $y = 2x + 1$. If we input a value for x, we get a unique output for y. Using the inputs 0, 1, 2, and 3, we get the following table:

x	$y = 2x + 1$	y
0	$y = 2(0) + 1$	1
1	$y = 2(1) + 1$	3
2	$y = 2(2) + 1$	5
3	$y = 2(3) + 1$	7

If we view the table with only the outside columns, it looks like this.

x	y
0	1
1	3
2	5
3	7

Therefore, the table can be represented by the equation $y = 2x + 1$.

Example

The function table shows the values of $f(n)$ for given values of n.

n	1	2	3	4
$f(n)$	9	13	17	21

Which function best represents the relationship between the quantities in the table?

A $f(n) = n^2$

B $f(n) = 9n$

C $f(n) = 4n + 5$

D $f(n) = 6n + 3$

Solution

The best way to solve this problem is by substituting the values for n and seeing if they correspond to the values for $f(n)$.

Check choice **A** $f(n) = n^2$:

n	1
$f(n)$	9

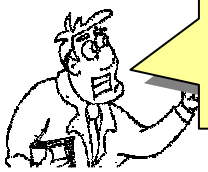
$f(1) = (1)^2 = 1 \neq 9$

Choice **A** $f(n) = n^2$ is not the answer.

Check choice **B** $f(n) = 9n$:

$$f(1) = 9(1) = 9$$
$$f(2) = 9(2) = 18 \neq 13$$

Choice **B** $f(n) = 9n$ is not the answer.



FACT

When checking to see if a function corresponds to a table, you must check all input and output values given in the table.

Check choice **C** $f(n) = 4n + 5$:

$$f(1) = 4(1) + 5 = 9$$
$$f(2) = 4(2) + 5 = 13$$
$$f(3) = 4(3) + 5 = 17$$
$$f(4) = 4(4) + 5 = 21$$

Choice **C** $f(n) = 4n + 5$ is the function that best represents the relationship between the quantities in the table.

Example

The table shows the number of anchovies on each size of pizza at Sal's Pizza Shop.

Size of Pizza	Radius of Pizza (in.)	Number of Anchovies
Small	4	18
Medium	6	26
Large	8	34
Extra Large	10	42

Let r represent the radius of the pizza and a represent the number of anchovies. Determine which equation best represents the relationship between the radius and number of anchovies.

A $r = a^2 + 2$

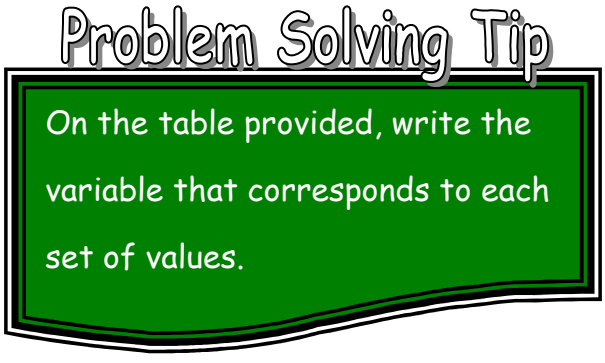
B $a = r^2 + 2$

C $r = 4a + 2$

D $a = 4r + 2$

Solution

Similar to the last problem, we will solve this by plugging values into each of the given equations and seeing if they work. This problem states that r represents the radius of the pizza and a represents the number of anchovies.



Radius of Pizza r	Number of Anchovies a
4	18
6	26
8	34
10	42

We will substitute values for *r* and *a* to see if they correspond with each other.

Check choice **A** $r = a^2 + 2$:

$$r = a^2 + 2$$
$$4 = (18)^2 + 2$$
$$4 = (324) + 2$$
$$4 \neq 326$$

Choice **A** $r = a^2 + 2$ is not the answer.

Check choice **B** $a = r^2 + 2$:

Size of Pizza	Radius of Pizza r	Number of Anchovies a
Small	4	18

$$a = r^2 + 2$$
$$18 = (4)^2 + 2$$
$$18 = 16 + 2$$
$$18 = 18$$

These worked for the first set of values, but let's check the second set to make sure the equation still works.

Medium	6	26

$$26 = (6)^2 + 2$$
$$26 = 36 + 2$$
$$26 \neq 38$$

Since the second values did not work, choice **B,** $a = r^2 + 2$, is not the answer.

Check choice **C** $r = 4a + 2$:

$$4 = 4(18) + 2$$
$$4 = 72 + 2$$
$$4 \neq 74$$

Choice **C** $r = 4a + 2$ is not the answer.

By process of elimination, it should seem obvious that choice **D** is the answer. We will still check to make sure this is true.

Check choice **D** $a = 4r + 2$:

Make sure to check that the all the values work.

Size of Pizza	Radius of Pizza r	Number of Anchovies a
Small	4	18
Medium	6	26
Large	8	34
Extra Large	10	42

$18 = 4(4) + 2$
$26 = 4(6) + 2$
$34 = 4(8) + 2$
$42 = 4(10) + 2$

As expected, choice **D** $a = 4r + 2$ is the equation that best represents the relationship between the radius and the number of anchovies.

1) The following table shows the value of a term in a given position in a sequence of numbers that follow a pattern. Which expression best represents the nth term?

A $n^2 - 4$

B $n - 4$

C $n - 2$

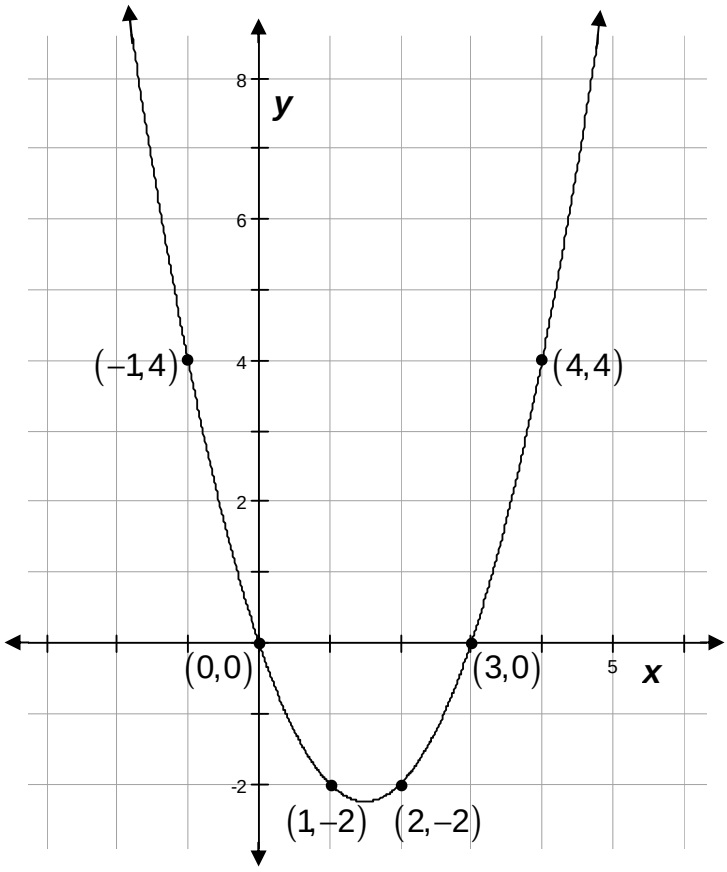
D $4 - n^2$

Position	Value of term
1	-3
2	0
3	5
4	12
n	?

Think Back

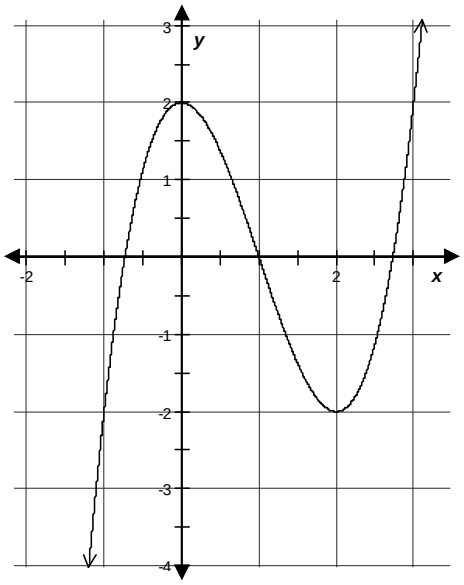
A function is a set of ordered pairs (x, y) in which each x-coordinate is paired with exactly one y-coordinate.

The other form of a function we will review is the graph. When graphing a function, we must plot points based on their coordinates. The coordinates of a point on the graph are shown by an ordered pair (*x*,*y*).



The above graph shows the function $f(x) = x^2 - 3x$ with 6 points labeled on it. Each of these six points is a solution to the function and they are as follows:

$$\{(-1,4),(0,0),(1,-2),(2,-2),(3,0),(4,4)\}$$



Example

Which of the following coordinates is a solution to the graph shown?

A $(1,1)$

B $(0,1)$

C $(2,0)$

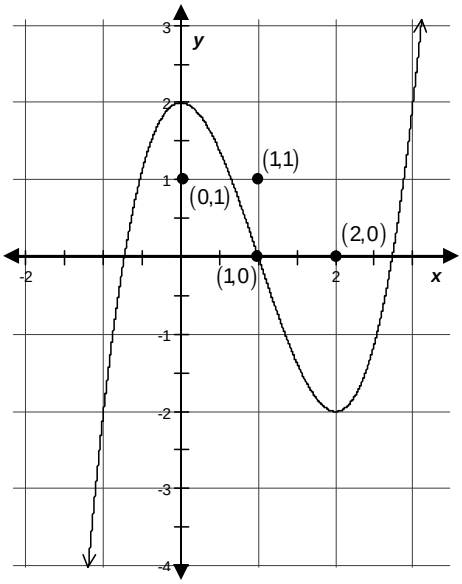
D $(1,0)$

Solution

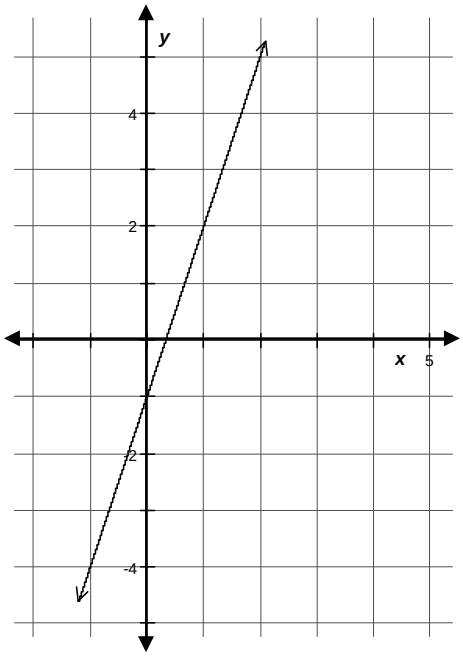
To solve this problem, we will plot all of the points listed as possible solutions, and see which one intersects the graph.

FACT

When plotting an ordered pair on a set of axes, the x-coordinate tells you how far left or right to go, and the y-coordinate tells you how far up or down to go.



After plotting all the points on the axes, the only point that is on the function is $(1,0)$. Therefore, the answer is choice **D** $(1,0)$.



Example

Which equation best represents the graph provided?

A $y = x^2 - 1$

B $y = 3x - 1$

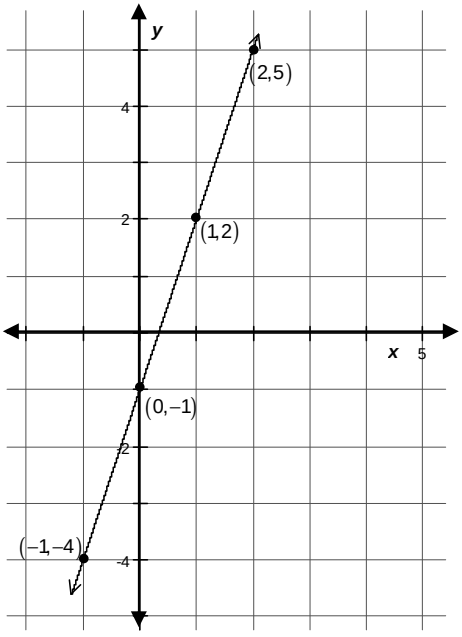
C $y = 4x^2 - 1$

D $y = -x - 1$

Solution

To solve this problem, we will locate points on the graph and see if they satisfy each of the equations.

First, locate points on the graph that have whole number coordinates.



$\{(-1,-4),(0,-1),(1,2),(2,5)\}$

These points are solutions to the graph of the function.

We now must determine whether these four points are solutions to the given equations.

Check Choice **A**, $y = x^2 - 1$, using $(-1,-4)$.

$$-4 = (-1)^2 - 1$$
$$-4 = 1 - 1$$
$$-4 \neq 0$$

Choice **A**, $y = x^2 - 1$, is not the solution

Think Back

To check if an ordered pair is a solution to an equation, plug the first number in for x and the second number in for y.

Check choice **B**, $y = 3x - 1$, using $(-1,-4)$.

$-4 = 3(-1) - 1$
$-4 = -3 - 1$
$-4 = -4$ ✓

Remember to check that all coordinates work before assuming this is the answer.

$(0,-1)$

$-1 = 3(0) - 1$
$-1 = 0 - 1$
$-1 = -1$ ✓

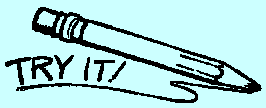
$(1,2)$

$2 = 3(1) - 1$
$2 = 3 - 1$
$2 = 2$ ✓

$(2,5)$

$5 = 3(2) - 1$
$5 = 6 - 1$
$5 = 5$ ✓

Since all the coordinates work, choice **B**, $y = 3x - 1$, is the solution.



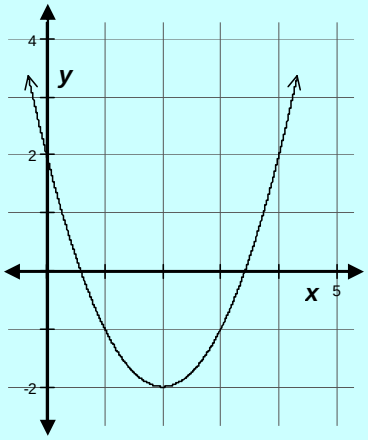
2) The graph of $y = x^2 - 4x + 2$ is shown to the right. Which point is not a solution to this equation?

A $(2,0)$

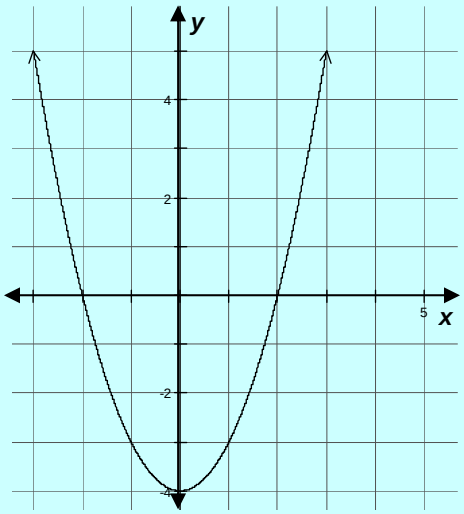
B $(0,2)$

C $(2,-2)$

D $(4,2)$



3) Which function best represents the function graphed to the right?



A $f(x) = x^2$

B $f(x) = 4 - x^2$

C $f(x) = x^2 - 4$

D $f(x) = x - 4$

☑ Review

Know these concepts:

1. A table can be represented by an equation if the inputs and outputs on the table correspond to each other after substitution into the equation.
2. An ordered pair is a solution to the graph of a function if the plotted point is on the function.
3. A graph and an equation are related if the ordered pairs that are solutions to the graph are solutions to the equation.

Practice Problems
Lesson 3

Directions: Write your answers in your math journal. Label this exercise TAKS Review – Lesson 3.

1) Which table contains points of the graph of the function $f(x) = 3x - 2$?

A

x	$f(x)$
1	1
2	4
3	7
4	10

B

x	$f(x)$
1	1
2	2
3	3
4	4

C

x	$f(x)$
1	-3
2	0
3	5
4	12

D

x	$f(x)$
1	0
2	-2
3	-5
4	-9

2) A movie theater has an increase in popcorn sales based on the number of movie tickets sold per night. The table provided shows the number of popcorn sales with respect to movie ticket sales. Which equation best represents the relationship between m, the number of movie ticket sales, and p, the number of popcorn sales?

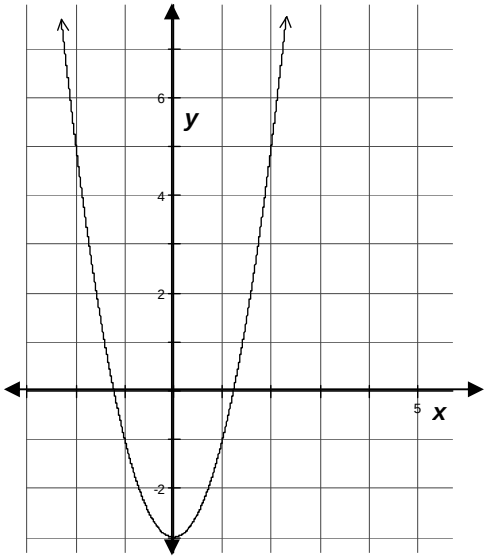
Movie ticket sales	Popcorn sales
100	40
200	90
300	140
400	190

A $p = 40m$ **B** $p = 0.4m$

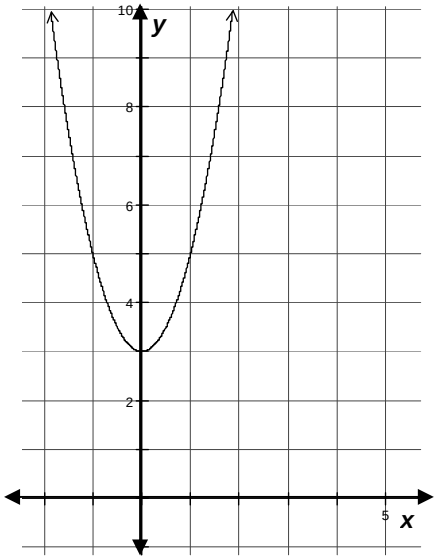
C $p = 0.5m - 10$ **D** $p = 4m + 100$

3) Which graph below represents the function $f(x) = 2x^2 + 3$?

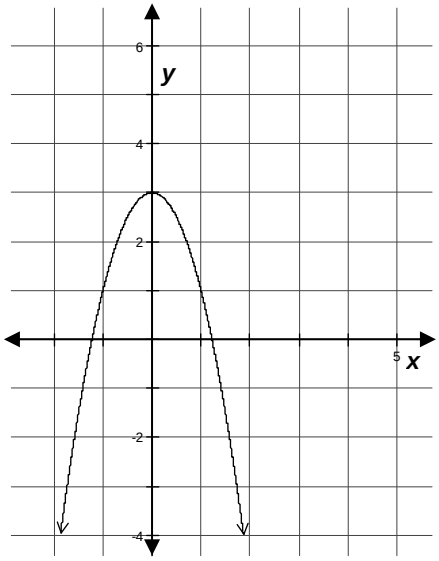
A



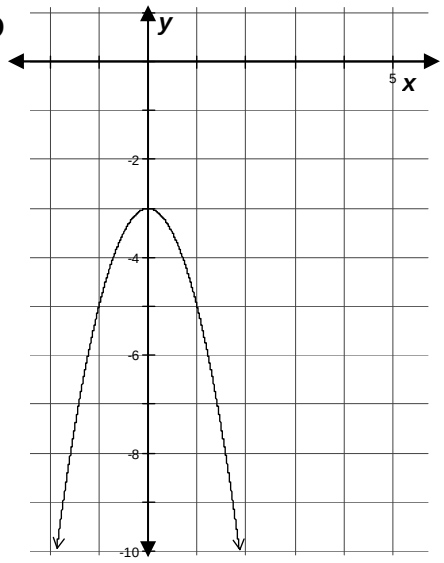
B



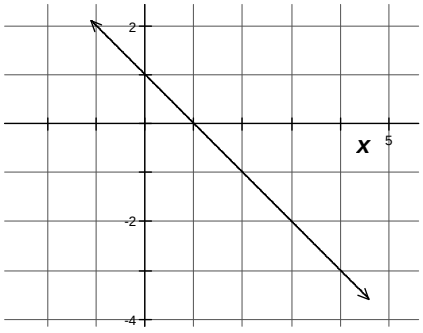
C



D



4) Which of the following ordered pairs is not a solution to the graph below?



A $(0,1)$

B $(1,0)$

C $(2,-1)$

D $(-2,1)$

1) A
2) A
3) C

End of Lesson 3