# CATEGORY 2 - Readiness Standard 3.B

Calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems.

1 The graph describes the number of cubic yards of cement in a truck as it is being poured into the frame for a building slab. What is the rate of change in cubic yards with respect to the number of minutes?
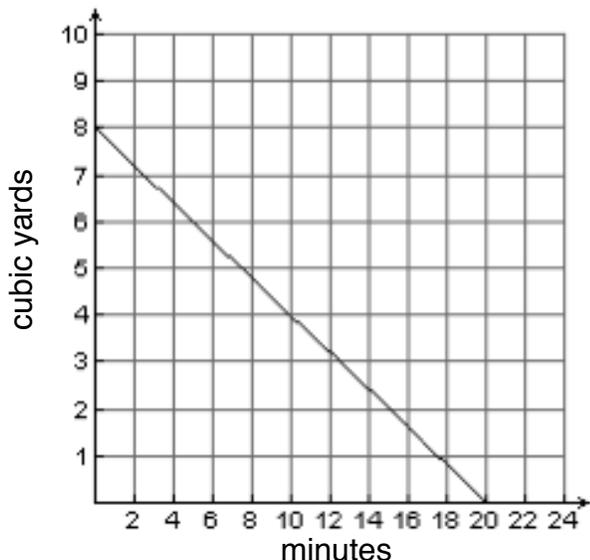
A an increase of 2.5 cubic yards

B a decrease of 0.4 cubic yards

C an increase of 20 minutes

D a decrease of 8 cubic yards

2 A linear function contains the point (-1, 5). The equation y - 5 = -2(x + 1) describes the line. What is the rate of change in y with respect to x?

A -2

B 5

C -1

D 2

3 A driver sets the cruise control of his car at 65 miles per hour. As he drives, the function *f(x)* = 18 - 0.05*x* describes the number of gallons in the car's gas tank. What is the rate of change for this function?

A 18 gallons

B 65 miles per hour

C 0.05 gallons per mile

D 17.95 miles per gallon

4 The table describes the altitude of a small airplane from the moment it started its descent toward an airport until it landed.

Elapsed Time (min)	Altitude (meters)
0	225
2	175
5	100
7	50
9	0

What is the rate of change for the linear function described by the table?

A 1/25 miles per minute

B -50 meters per minute

C 225 miles per hour

D -25 meters per minute

cont'd

CATEGORY 2 - Readiness Standard 3.B (cont'd)

Calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems.

5 A downtown parking lot calculates the amount to charge customers according to the function $y = 5 + 3x$, where y is the total charge and x is the number of hours their vehicle was parked. What is the rate of change in the charge with respect to the number of hours?

- **A** $5
- **B** $3
- **C** $8
- **D** $2

6 A movie club advertises movie tickets at a discount price if you pay a membership fee every year. The graph shows the total yearly cost for x tickets.
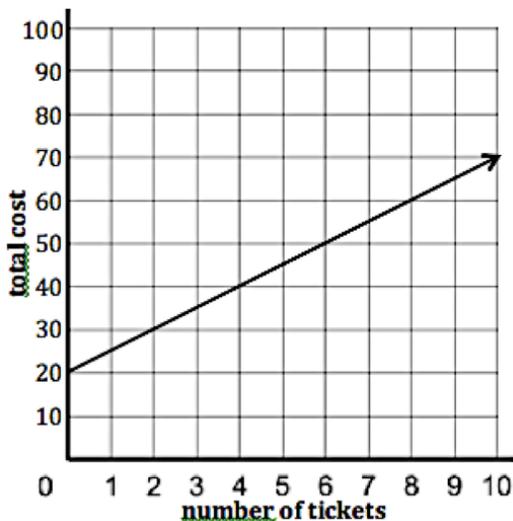
What is the rate of change in the total cost with respect to the number of tickets?

- **A** 7 dollars per ticket
- **B** 20 dollars per member
- **C** 10 tickets per member
- **D** 5 dollars per ticket

7 The table shows the value of a factory machine that was purchased for $22,000. The function represented by the table is linear. Which best represents the rate of change in the value of the machine with respect to the number of years?

age in years	value ($)
1	19,500
2	17,000
3	14,500
4	12,000

- **A** $2,500 per year
- **B** -$3,000 per year
- **C** -$2,500 per year
- **D** $1875 per year

8 As the price of an item increases, the demand for it decreases. A market researcher at a store found that when the price of a bike was $110, they could make 100 sales. When the price was set at $150, only 20 sales were made. Assuming the demand function is linear, what is the rate of change in the number of sales with respect to the price?

Hint: Use the points (110, 100) and (150, 20)

- **A** an increase of $0.50 per sale
- **B** a decrease of 80 sales per bike
- **C** a decrease of 2 sales per dollar
- **D** an increase of $40 per bike

CATEGORY 4 - Readiness Standard 7.A

Graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry.

1 Which graph best represents a function which has the zeros 1 and -7?

A

B

C

D
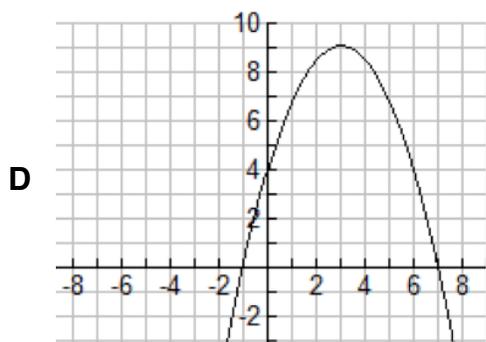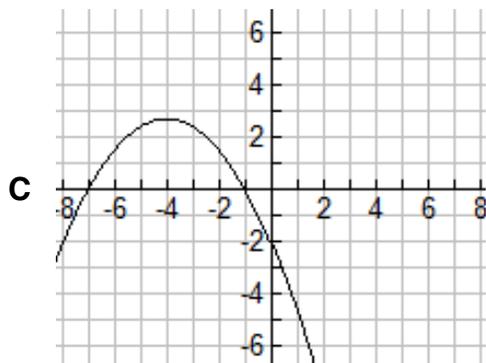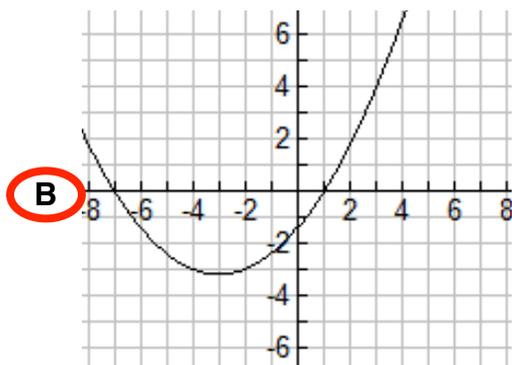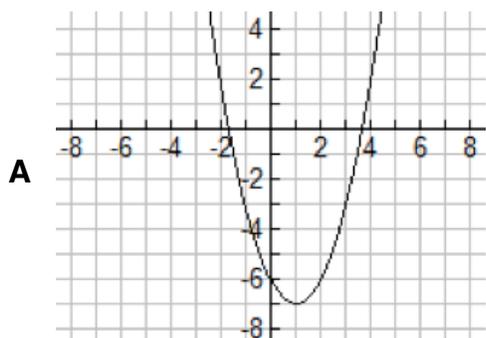
2 What are the *x*-intercepts of the graph of the function $y = 5(x - 4)(x - 3)$?

   A (0, 4) and (0, 3)

   B (3, 0) and (4, 0)

   C (-20, 0) and (-15, 0)

   D (0, 15) and (0, 20)

3 Which equation best represents the graph shown?

   A $y = (x - 5)(x + 3)$

   B $y = (x + 5)(x - 3)$

   C $y = (x - 1)(y + 16)$

   D $y = (x +1)(y -16)$

cont'd

CATEGORY 4 - Readiness Standard 7.A (cont'd)

Graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry.
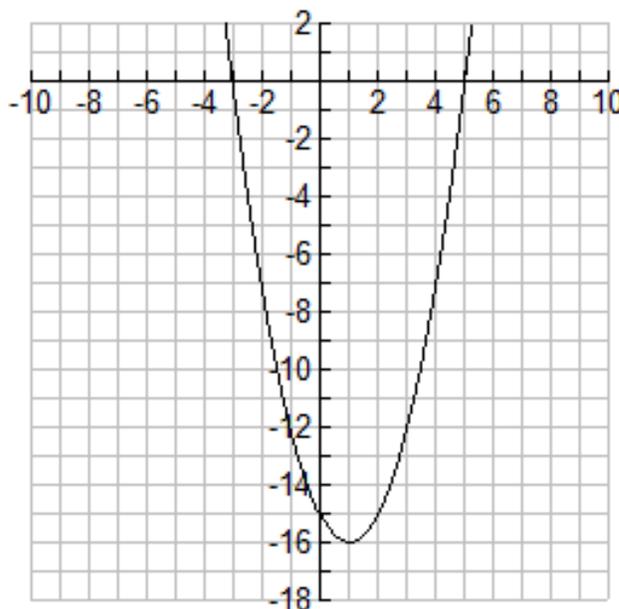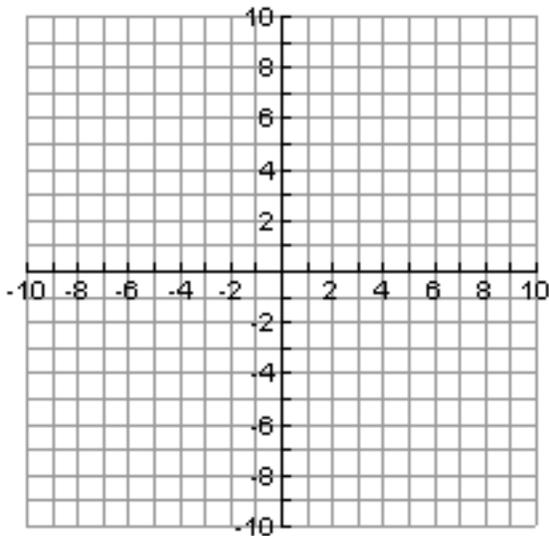
**4** The ordered pairs in the table belong to a quadratic function, *f(x)*, which has a line of symmetry at $x = 3$.

x	2	4	6	7
y	-8	-8	0	7

Which statement is **not** a valid statement about this function?

A The only *y*-intercept of *f* is 0.

B The graph of *f* contains (-1, 7).

C The only *x*-intercept of *f* is 6.

D The vertex of *f* represents a minimum value for *f(x)*.

5 Which ordered pair describes one of the zeros of the function $f(x) = 2x^2 - 3x - 2$?

A (0.5, 0)

B (0, 2)

C (-0.5, 0)

D (0, -2)

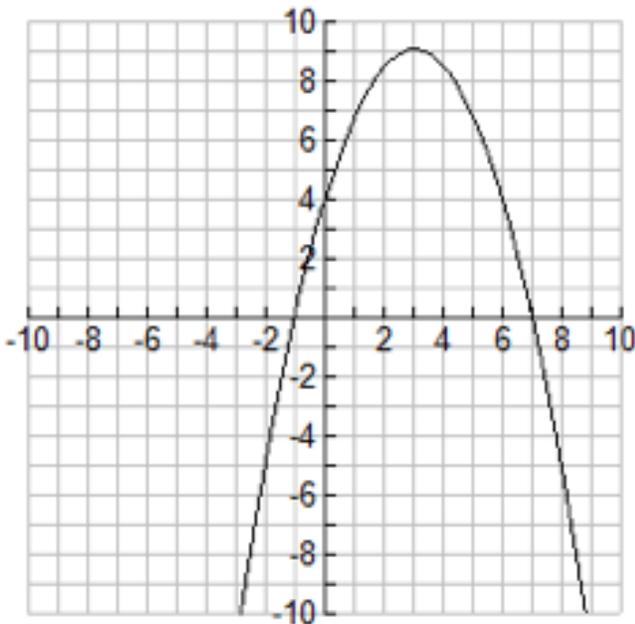*The graph of $g(x) = x^2 - 2x - 8$ is shown. Use the graph to answer items 6-7.*
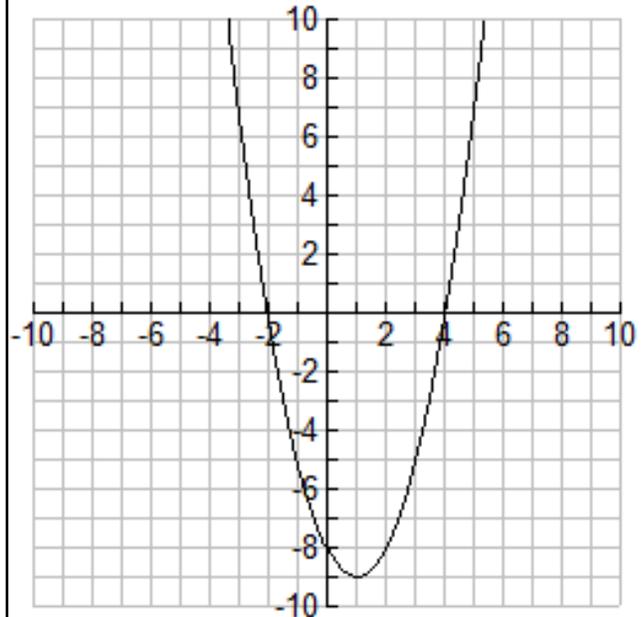
6 Which equation describes the parabola's line of symmetry?

A $x = 1$

B $y = 1$

C $x = -9$

D $y = -9$

7 Which statement about *g(x)* is correct?

A The maximum value of *g(x)* is 10.

B The minimum value of *g(x)* is -2.

C The maximum value of *g(x)* is 4.

D The minimum value of *g(x)* is -9.

cont'd

CATEGORY 4 - Readiness Standard 7.A (cont'd)

Graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry.

The graph of f(x) is shown. Use the graph to answer items 8-9.

10 A part of the graph of a quadratic function is shown.

The graph has a line of symmetry at x = 2. Between which 2 negative integers will the graph show a zero of the function?

A Between -7 and -6

B Between -5 and -4

C Between -3 and -2

D Between -2 and -1

8 What are the coordinates of the vertex of the parabola?

A (0, 4)

B (-3, 9)

C (7, 0)

D (3, 9)

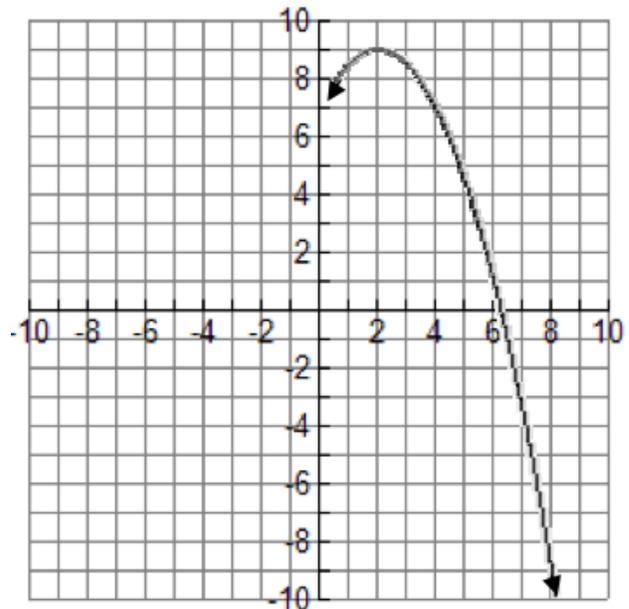**9** What are the coordinates of the x- and y-intercepts of the parabola?

A (0, -1), (0, 9) and (0, 4)

B (-1, 0), (9, 0) and (0, 4)

C (0, -1), (0, 9) and (4, 0)

D (1, 0), (-9, 0) and (0, -4)

CATEGORY 5 - Supporting Standard 9.B

Interpret the meaning of the values of a and b in exponential functions of the form f(x) = abˣ in real-world problems.

1 Ecologists have determined that they can use the function $f(x) = 1050(0.86)^x$ to estimate the number of a particular type of endangered fish in a lake x years after 2016. What is the meaning of the number 0.86 in the equation?

   A The fish population will grow by 86% every year after 2016.

   B Every year after 2016 there will be 86 fewer fish in the lake than the previous year.

   C The fish population will decrease by 86% every year after 2016.

   D Each year after 2016 the fish population will be 86% of the previous year's total.

2 The formula $f(x) = 5000(1.05)^x$ can be used to determine the amount of an investment after x years. What does the number 5000 in the formula represent?

   A The amount invested is $5000.

   B The interest rate on the investment is 5000%.

   C The investment will have a value of $5000 at maturity.

   D The investment will yield a profit of $5000.

3 A ruthenium-106 isotope has a half-life of about one year. The function

$$f(x) = 600(0.5)^x$$

can be used to estimate the mass of a sample of this isotope that remains radioactive after x years. What does the number 600 represent in the equation?

   A the number of years the isotope will decay

   B the mass of the sample at year 0

   C the decay factor for the isotope

   D the growth factor for the isotope

4 Mr. Wong is an art collector. He just purchased a painting. The function

$$f(x) = 2500(1.1)^x$$

can be used to estimate the value of the painting x years from now. Which statement is correct?

   A The painting will depreciate by 10% per year.

   B The painting will be worth $2500 after x years.

   C Mr. Wong paid $2750 for the painting.

   D The value of the painting will increase 10% every year.

CATEGORY 5 - Readiness Standard 9.C

Write exponential functions in the form $f(x) = ab^x$ (where b is a rational number) to describe problems arising from mathematical and real-world situations, including growth and decay.

1 The table shows the number of children enrolled in a new daycare facility during the first 4 months of operation. Which equation best describes the relationship between the month number and the number of children enrolled?

Month #	1	2	3	4
No. of children	4	8	16	32

A $y = 4(2^x)$

B $y = 2(4^x)$

C $y = 4(\frac{1}{2})^x$

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

2 Suppose a factory has been dumping 80 tons of pollutants into a river every year. A law recently passed requires the factory to reduce the amount of pollutants by 20% every year. Which function expresses the amount of pollutants it can dump x years after the law goes into effect?

A $f(x) = 80(0.2)^x$

B $f(x) = 80(0.8)^x$

C $f(x) = 80(0.02)^x$

D $f(x) = 20(0.8)^x$

3 The graph shows the number of people who had heard a rumor during the few hours after it was started. What is the equation of the function?
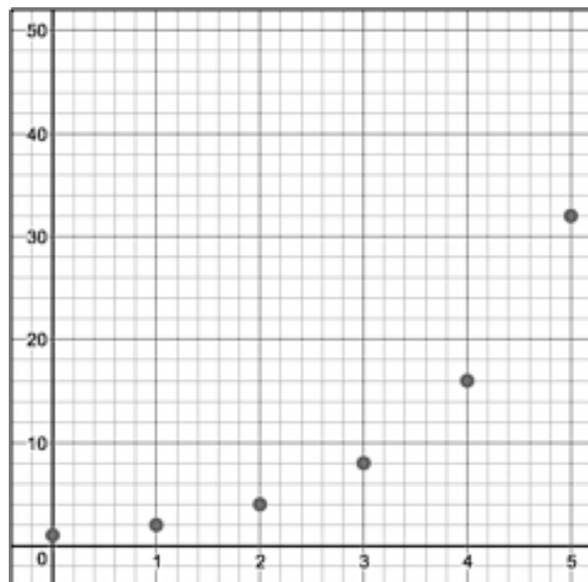
A $y = 2^x$

B $y = 2(2^x)$

C $y = 0.5^x$

D $y = x^2$

4 The ordered pairs (1, 6), (2, 9) and (3, 13.5) belong to an exponential function. Which equation describes this function?

A $f(x) = 6(\frac{3}{2})^x$

B $f(x) = 4(\frac{2}{3})^x$

C $f(x) = 4(\frac{3}{2})^x$

D $f(x) = 6(\frac{2}{3})^x$