

VIRGINIA STANDARDS OF LEARNING

**Released Test**

# **ALGEBRA II**

## **2009 Mathematics Standards of Learning**

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Released Spring 2014

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**SAMPLE A**

Which expression is equivalent to  $\sqrt{\frac{7x}{16}}$  ?

☐ **A**  $\frac{7x}{4}$

☐ **B**  $\frac{7x}{8}$

☐ **C**  $\frac{\sqrt{7x}}{4}$

☐ **D**  $\frac{\sqrt{7x}}{8}$

Directions: Type your answer in the box.

**SAMPLE B**

What value of  $x$  makes  $\sqrt{x} - 3 = 6$  true?

Which expression is equivalent to  $\frac{3n}{n+3} + \frac{5}{n-4}$  if no denominator equals zero?

☐ A  $\frac{3n^2 - 7n + 3}{(n+3)(n-4)}$

☐ B  $\frac{3n^2 - 7n + 15}{(n+3)(n-4)}$

☐ C  $\frac{3n^2 + 5n + 3}{(n+3)(n-4)}$

☐ D  $\frac{3n^2 + 5n + 15}{(n+3)(n-4)}$

Which number is equivalent to  $(-6 - i) + 5i - (11 + 13i)$  ?

- ☐ A  $-17 - 9i$
- ☐ B  $-17 + 17i$
- ☐ C  $-5 - 9i$
- ☐ D  $-5 + 17i$

Which of the following is the factored form of  $x^3 - 216$  ?

- ☐ A  $(x - 6)^3$
- ☐ B  $(x - 6)(x^2 + 36)$
- ☐ C  $(x - 6)(x^2 + 12x + 36)$
- ☐ D  $(x - 6)(x^2 + 6x + 36)$

Which expression is equivalent to  $\sqrt{75x^3} - \sqrt{27x^3}$ , if  $x > 0$  ?

- ☐ A  $4x\sqrt{6x}$
- ☐ B  $4x\sqrt{3x}$
- ☐ C  $2x\sqrt{6x}$
- ☐ D  $2x\sqrt{3x}$

Assuming that no denominator equals zero, which is equivalent to  $\frac{r^2 - r - 6}{(r - 2)(r - 3)}$ ?

- ☐ A  $\frac{r+2}{r-2}$
- ☐ B  $\frac{r+3}{r-3}$
- ☐ C  $\frac{r+2}{r-1}$
- ☐ D  $\frac{2(r-1)}{r-2}$



Which expression is equivalent to  $\sqrt[4]{16x^{15}y^{17}}$ , where  $x > 0$  and  $y > 0$ ?

☐ A  $4x^{11}y^{13}$

☐ B  $4x^{\frac{15}{4}}y^{\frac{17}{4}}$

☐ C  $2x^{11}y^{13}$

☐ D  $2x^{\frac{15}{4}}y^{\frac{17}{4}}$

Which is equivalent to  $(6 + \sqrt{7})(5 + \sqrt{7})$  ?

- ☐ A  $11 + 2\sqrt{7}$
- ☐ B  $30 + 11\sqrt{7}$
- ☐ C  $30 + 18\sqrt{7}$
- ☐ D  $37 + 11\sqrt{7}$

Directions: Click and drag each selected term to the correct box.

Simplify completely:  $\sqrt[3]{162x^6y^7}$

$\sqrt[3]{$

2	3	6	9
$x$	$x^2$	$x^3$	$x^4$
$y$	$y^2$	$y^3$	$y^4$

Which expression is equivalent to  $x^{\frac{3}{7}}y^{\frac{36}{7}}$  ?

☐ A  $\frac{1}{7}\sqrt{x^3y^{36}}$

☒ B  $\frac{1}{7}y^5\sqrt{x^3y}$

☐ C  $y^5\sqrt[7]{x^3y}$

☐ D  $x^3y^5\sqrt[7]{y}$

Directions: Click and drag each selected binomial to the box.

Factor the following polynomial.

$$8x^2 - 18xy - 5y^2 =$$

$(x + 5y)$

$(2x - 5y)$

$(2x - y)$

$(4x + y)$

$(4x + 5y)$

$(8x - y)$

**Which statement illustrates the symmetric property of equality?**

- ☐ **A** If  $7\sqrt{x} + 17i = 49i$ , then  $7\sqrt{x} + 17i = 49i$ .
- ☐ **B** If  $7\sqrt{x} + 17i = 49i$ , then  $49i = 7\sqrt{x} + 17i$ .
- ☐ **C** If  $7\sqrt{x} + 17i = 49i$  and  $49i = 12\sqrt{x} - 3i$ , then  $7\sqrt{x} + 17i = 12\sqrt{x} - 3i$ .
- ☐ **D** If  $7\sqrt{x} + 17i = 49i$  and  $7\sqrt{x} + 17i - y = -35i$ , then  $49i - y = -35i$ .

Directions: Click on the box to choose each expression you want to select. You must select all the correct expressions.

Identify each expression that is equivalent to  $(i)$ .

$i^{47}$	$i^{33}$	$i^{21}$	$i^{15}$
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Given:

$$\frac{\frac{n-15}{9n}}{\frac{15-n}{3n^5}}$$

Assuming no denominator equals zero, which expression is equivalent to the given expression?

- ☐ A  $\frac{-n^4}{3}$
- ☐ B  $\frac{n^4}{3}$
- ☐ C  $\frac{-3}{n^4}$
- ☐ D  $\frac{3}{n^4}$

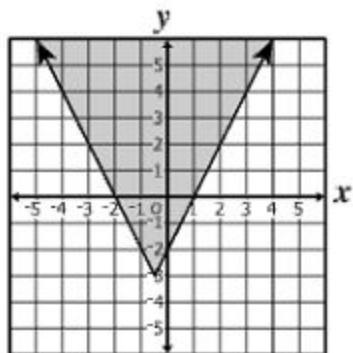


What is the solution set of  $\sqrt{8x-1} + 4 = 8$  ?

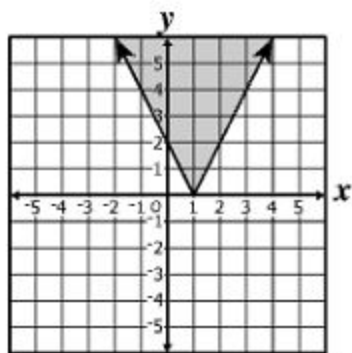
- ☐ A  $\left\{\frac{67}{8}\right\}$
- ☐ B  $\left\{\frac{61}{8}\right\}$
- ☐ C  $\left\{\frac{17}{8}\right\}$
- ☐ D  $\left\{\frac{15}{8}\right\}$

Which graph best represents the solution for  $y \geq |2x + 1| - 3$ ?

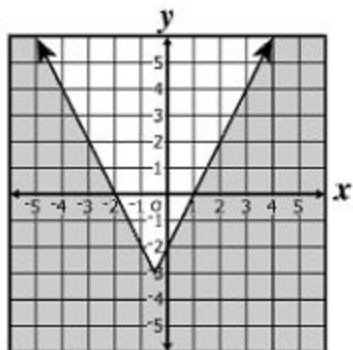
☐ A



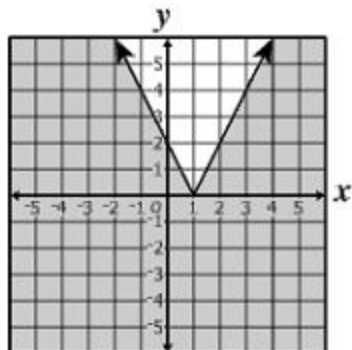
☐ C



☐ B



☐ D



Directions: Click on the correct answer.

What is the solution set to  $x^2 = 16 - 4x$  ?

$$\{ \pm 4 \}$$

$$\{ 2 \pm 2\sqrt{5} \}$$

$$\{ 2 \pm 2i\sqrt{3} \}$$

$$\{ -2 \pm 2\sqrt{5} \}$$

$$\{ -2 \pm 2i\sqrt{3} \}$$

What is the solution set for  $\sqrt[3]{\frac{1}{4}x + 3} = 2$  ?

☐ A  $\left\{\frac{5}{4}\right\}$

☐ B  $\left\{\frac{11}{4}\right\}$

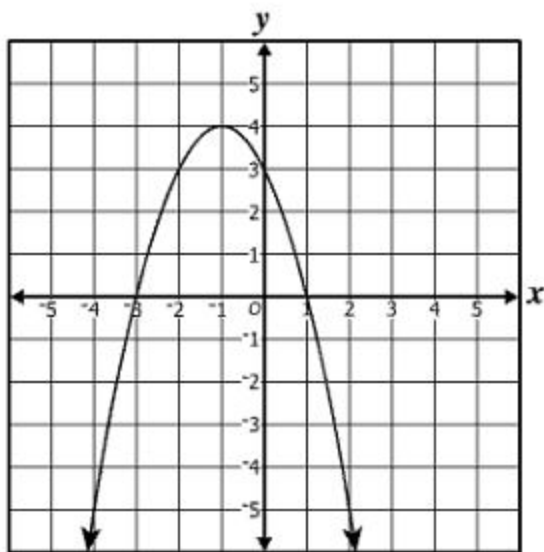
☐ C  $\{20\}$

☐ D  $\{44\}$

What is the solution to  $|x + 4| < 2$ ?

- ☐ A  $x < -6$  or  $x > -2$
- ☐ B  $-6 < x < -2$
- ☐ C  $x < -2$
- ☐ D  $2 < x < 6$

The graph of  $g(x)$  is shown.



Which appears to be a solution of  $g(x) = 0$  ?

- ☐ A -3
- ☐ B -1
- ☐ C 0
- ☐ D 3

Given:  $\begin{cases} x + y + 10 = 0 \\ x^2 + y - 2 = 0 \end{cases}$

What are the  $x$ -values for the solutions to the given system of equations?

- ☐ A  $x = -3, -7$
- ☐ B  $x = -3, 4$
- ☐ C  $x = -4, 3$
- ☐ D  $x = 4, -14$

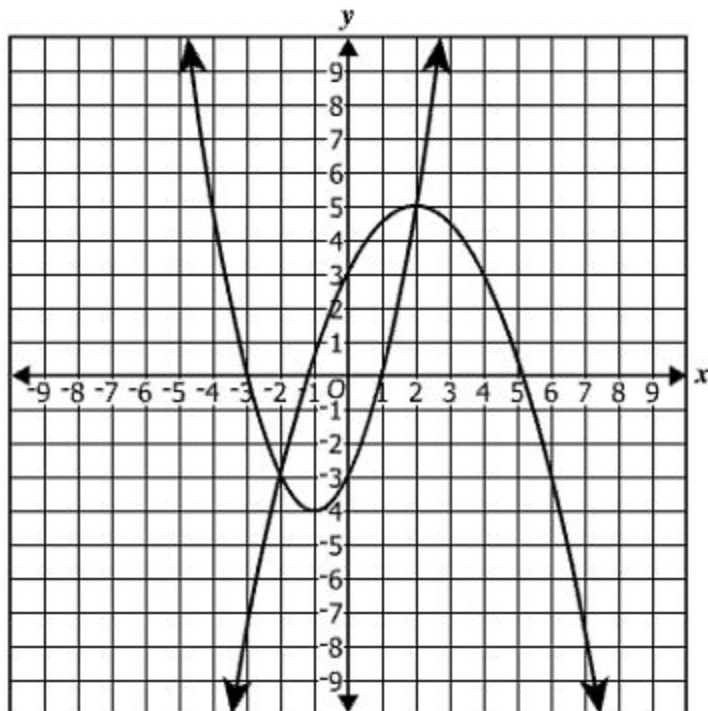
Which is a solution for  $\sqrt[4]{w-4} + 11 = 14$  ?

- ☐ A  $w = 8$
- ☐ B  $w = 16$
- ☐ C  $w = 77$
- ☐ D  $w = 85$



**Directions:** Click on the grid to plot each point that is a solution. You must plot all correct solutions.

**The graph of a system of two equations is shown on the grid. Identify only the apparent solutions to this system of equations.**



Which is a solution to  $\frac{4n-37}{3} = \frac{10}{n}$ , if  $n \neq 0$ ?

☐ A -10

☐ B  $-\frac{27}{4}$

☐ C  $-\frac{10}{11}$

☐ D  $-\frac{3}{4}$

Which is a solution of  $|2x - 7| + 1 = 9$ ?

☐ **A**  $x = \frac{17}{2}$

☐ **B**  $x = \frac{1}{2}$

☐ **C**  $x = -\frac{1}{2}$

☐ **D**  $x = -\frac{3}{2}$

Directions: Type your answer in the box.

If  $x \neq 0$ , what is the solution to the following equation?

$$\frac{1-x}{x} + 2 = \frac{7}{x}$$

$x =$

A solution to a quadratic equation is  $13 - 11i\sqrt{7}$ . Which of the following must also be a solution to this equation?

- ☐ A  $-13 - 11i\sqrt{7}$
- ☐ B  $-13 + 11i\sqrt{7}$
- ☐ C  $13 - 11i\sqrt{7}$
- ☐ D  $13 + 11i\sqrt{7}$

Which of the following functions does NOT have a range of only the real numbers greater than or equal to zero?

☐ A  $f(x) = \sqrt{4-x}$

☐ B  $f(x) = |x-4|$

☐ C  $f(x) = x^4$

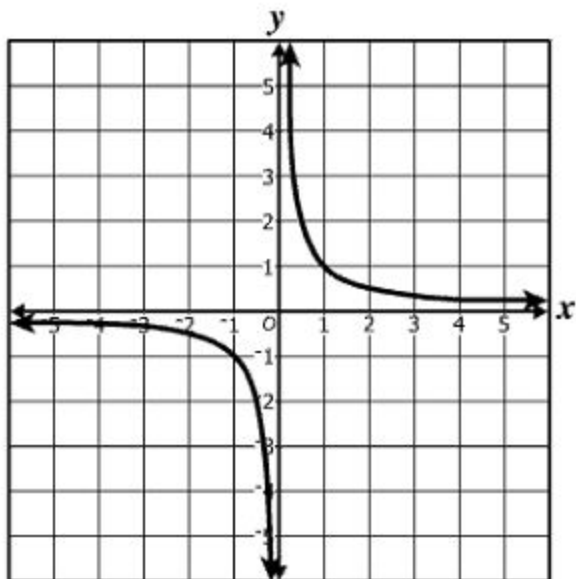
☐ D  $f(x) = \log x$

Directions: Type your answer in the box.

What is the sum of this infinite series?

$$100 + 60 + 36 + \frac{108}{5} + \dots$$

The graph of a parent function is shown.



Which function belongs to this same family?

☐ A  $g(x) = -\log(x - 1)$

☐ B  $g(x) = \left(\frac{1}{3}\right)^{(x-1)}$

☐ C  $g(x) = 3^{(x-1)}$

☐ D  $g(x) = \frac{3}{x-1}$



Which number is a zero of  $f(x) = \log(4x - 1)$ ?

☐ A  $\frac{7}{2}$

☐ B  $\frac{11}{4}$

☐ C  $\frac{1}{2}$

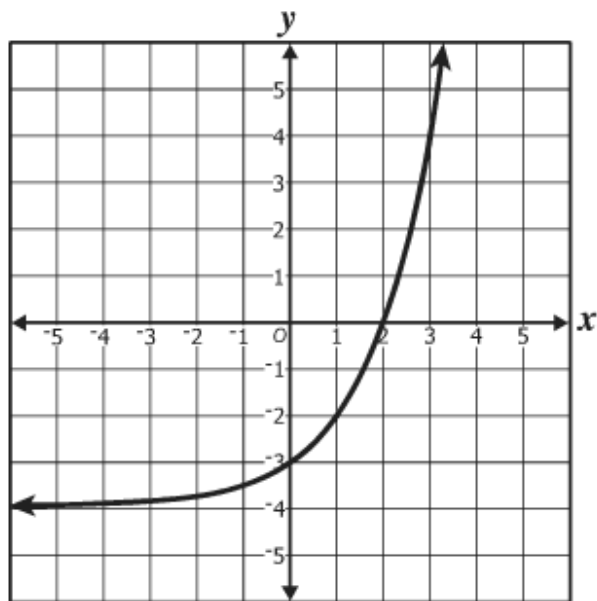
☐ D  $\frac{1}{4}$

What is the equation of the horizontal asymptote of the graph of the following equation?

$$f(x) = 6^{(x-5)} - 4$$

- ☐ A  $y = 6$
- ☐ B  $y = 0$
- ☐ C  $y = -4$
- ☐ D  $y = -5$

Which function best represents this graph?



- ☐ A  $f(x) = 2^{(x+2)}$
- ☐ B  $f(x) = 2^{(x-2)}$
- ☐ C  $f(x) = 2^x - 3$
- ☐ D  $f(x) = 2^x - 4$

The graph of  $g(x) = \log(2x)$  has —

- ☐ A no  $x$ -intercept or  $y$ -intercept
- ☐ B one  $x$ -intercept and no  $y$ -intercept
- ☐ C two  $x$ -intercepts and no  $y$ -intercept
- ☐ D one  $x$ -intercept and one  $y$ -intercept

Throughout which of the following intervals is  $f(x) = (x - 1)(x - 4)^2$  only decreasing?

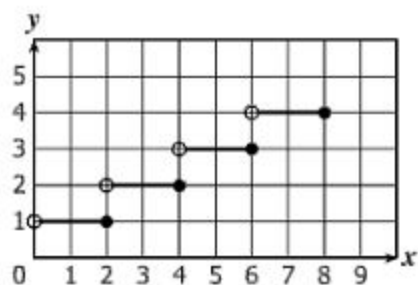
- ☐ A  $-\infty < x < 0$
- ☐ B  $-\infty < x < 1$
- ☐ C  $1 < x < 4$
- ☐ D  $2 < x < 4$

**Given:**  $f(x) = \log(x - 16) + 15$

**What is the equation of an asymptote of the graph of the given function?**

- ☐ **A**  $x = 16$
- ☐ **B**  $y = 16$
- ☐ **C**  $x = 15$
- ☐ **D**  $y = 15$

The graph of a function is shown on the grid.



What appears to be the range of this function?

- ☐ A  $\{y \mid y = 1, 2, 3, 4\}$
- ☐ B  $\{y \mid y = 0, 2, 4, 6, 8\}$
- ☐ C  $\{y \mid 1 < y < 4\}$
- ☐ D  $\{y \mid 0 < y < 8\}$

The heights of a large population of ostriches are normally distributed. Which is closest to the percentage of these heights that is within 3 standard deviations of the mean?

- ☐ A 0.3%
- ☐ B 5%
- ☐ C 95%
- ☐ D 99.7%



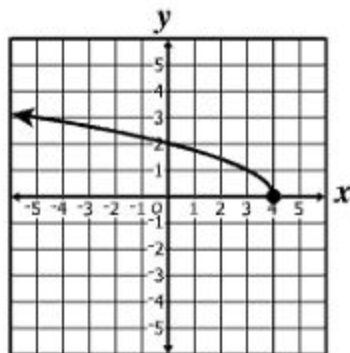
**Which of these situations involves a combination?**

- ☐ **A** Determining how many different groups of 3 employees can be chosen from 10 employees
- ☐ **B** Determining how many different seating charts can be made placing 7 people around a table
- ☐ **C** Determining how many different ways 8 runners can be assigned lanes on a track for a preliminary race
- ☐ **D** Determining how many different 6-letter passwords can be made using the letters in the word "pencil"

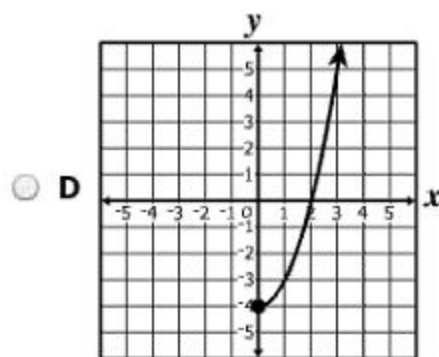
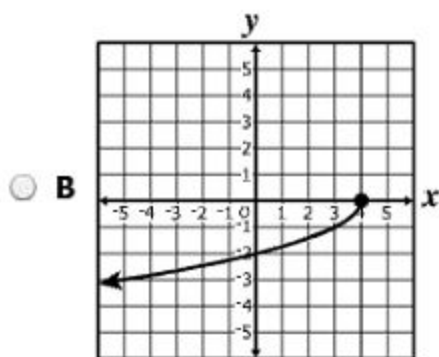
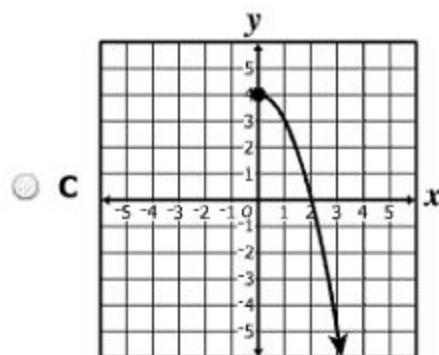
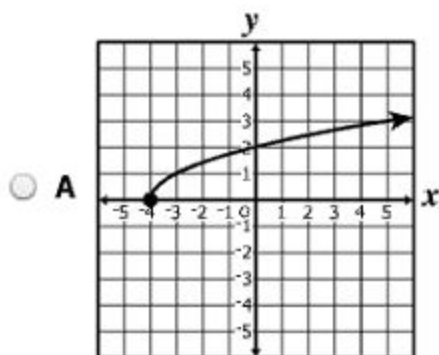
What is the 14th term of the arithmetic sequence with a first term of 7 and a common difference of 10 ?

- ☐ A 130
- ☐ B 137
- ☐ C 147
- ☐ D 221

The graph of the function  $g$  is shown on the following grid.



Which graph best represents the inverse of  $g$ ?



Directions: Click on a box to choose each ordered pair you want to select. You must select all correct ordered pairs.

Identify each of the  $x$ - and  $y$ -intercepts of the function  $h(x) = x^3 + 3x^2 - 4x - 12$ .

<input type="checkbox"/> $(-3, 0)$	<input type="checkbox"/> $(0, -2)$
<input type="checkbox"/> $(-2, 0)$	<input type="checkbox"/> $(0, 0)$
<input type="checkbox"/> $(0, -12)$	<input type="checkbox"/> $(0, 2)$
<input type="checkbox"/> $(0, -3)$	<input type="checkbox"/> $(2, 0)$

Which of the following describes the end behavior of  $y = -x^2 + bx + c$  as  $x$  approaches either positive or negative infinity?

- ☐ A  $y$  approaches positive infinity
- ☐ B  $y$  approaches negative infinity
- ☐ C  $y$  approaches  $c$
- ☐ D  $y$  approaches  $-\frac{c}{b}$

If  $f(x) = \frac{2}{3}x^2 + 1$  and  $g(x) = 6x - 15$ , which polynomial is equivalent to  $g(f(x))$ ?

- ☐ A  $4x^2 - 13$
- ☒ B  $4x^2 - 9$
- ☐ C  $4x^3 - 10x^2 + 6x - 15$
- ☐ D  $16x^2 - 80x + 101$

The domain of the function  $f(x) = \frac{x+3}{x^2+5x-24}$  is all real numbers except —

- ☐ A -8, -3, 3
- ☐ B -8, 3
- ☐ C -3, 8
- ☐ D 8

The amount of work ( $W$ ) done when lifting an object varies jointly with the mass of the object ( $M$ ) and the distance the object is lifted ( $D$ ). Which equation models this relationship?

☐ A  $W = \frac{k}{MD}$

☐ B  $W = \frac{kM}{D}$

☐ C  $W = kMD$

☐ D  $W = \frac{kD}{M}$



Madison deposited \$1,000 into a savings account that compounds interest yearly. After her initial deposit, Madison did not withdraw or deposit any money from this account. The table below shows the amount in her savings account over a period of years.

**Amount in Savings Account**

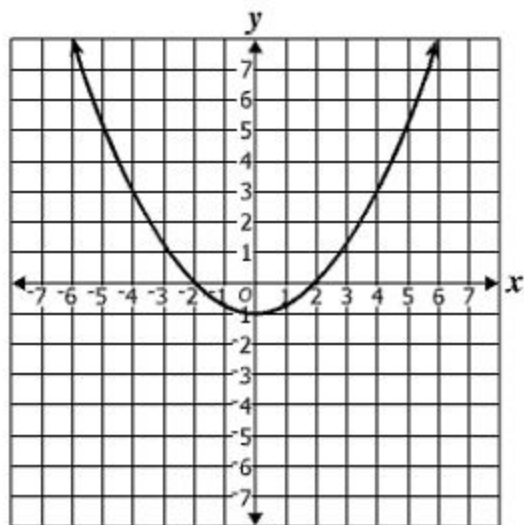
<b>Number of Years After the Deposit</b>	<b>Amount in Savings</b>
2	\$1,123.60
4	\$1,262.48
6	\$1,418.52
8	\$1,593.85
10	\$1,790.85

Using the exponential curve of best fit, which is closest to the expected amount in the savings account 30 years after the time Madison deposited the initial \$1,000 ?

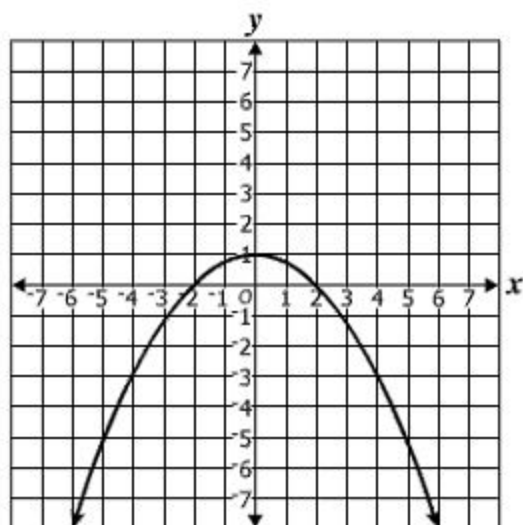
- ☐ A \$2,854
- ☐ B \$3,291
- ☐ C \$5,743
- ☐ D \$16,854

Which graph best represents a function with zeros of  $-2$ ,  $-1$ , and  $2$ ?

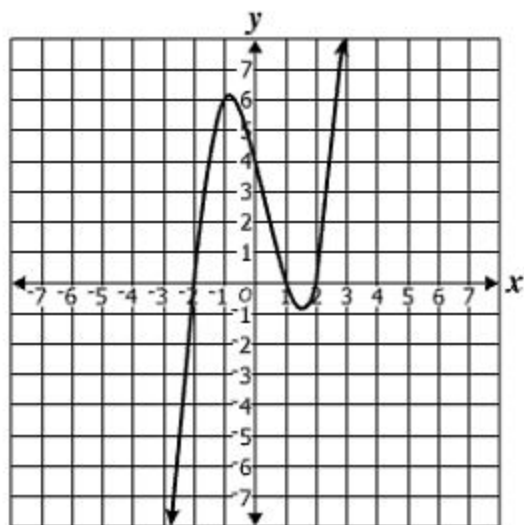
☐ A



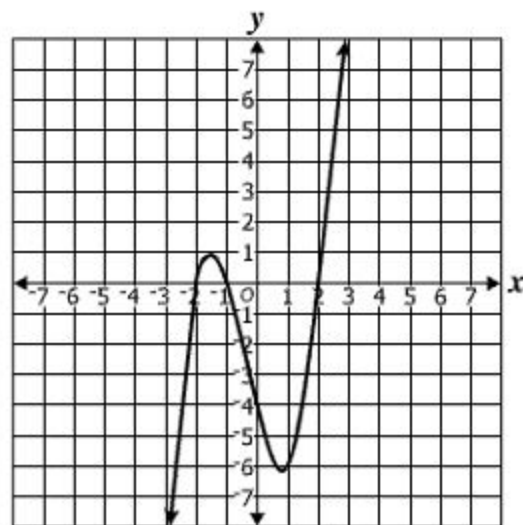
☐ C



☐ B



☐ D



The number of permutations of 8 objects taken 3 at a time is —

- ☐ A 40,320
- ☐ B 6,720
- ☐ C 4,920
- ☐ D 336

If  $y$  varies inversely as the square root of  $x$ , what is the constant of proportionality if  $y = 16$  when  $x = 4$  ?

- ☐ A 4
- ☐ B 8
- ☐ C 32
- ☐ D 64

Which of the following describes the root(s) of the equation  $9x^2 = 6x - 1$  ?

- ☐ **A** Exactly one real root
- ☐ **B** Two distinct real roots
- ☐ **C** Exactly one imaginary root
- ☐ **D** Two distinct imaginary roots