**Student Name** _____

P

MCAP

**Maryland Comprehensive Assessment Program**

# Algebra II

# Test Book

***Practice Test***

***Large Print***

TEST BOOKLET SECURITY BARCODE

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# Section 1
# (Non-Calculator)

**Directions:**

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## EXAMPLES

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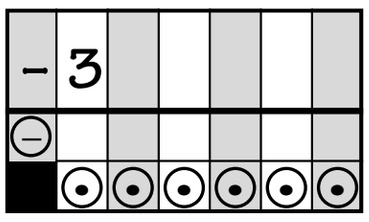


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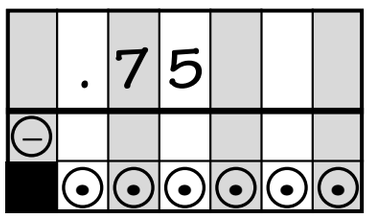


**1** An equation is shown.

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

What are the solutions to the equation?

**A** $\frac{5 + i\sqrt{7}}{4}$ and $\frac{5 - i\sqrt{7}}{4}$

**B** $\frac{5 + i\sqrt{57}}{4}$ and $\frac{5 - i\sqrt{57}}{4}$

**C** $\frac{-5 + i\sqrt{7}}{4}$ and $\frac{-5 - i\sqrt{7}}{4}$

**D** $\frac{-5 + i\sqrt{57}}{4}$ and $\frac{-5 - i\sqrt{57}}{4}$

**2** The recursive rule for a sequence is shown, where $n$ represents a positive integer.

$$f(1) = 5$$
$$f(n) = 3 \cdot f(n - 1), \text{ for } n > 1$$

Which is an explicit rule for the sequence?

**A** $f(n) = 3(5)^{n-1}$, for $n \geq 1$

**B** $f(n) = 5(3)^{n-1}$, for $n \geq 1$

**C** $f(n) = 3 + 5(n - 1)$, for $n \geq 1$

**D** $f(n) = 5 + 3(n - 1)$, for $n \geq 1$

**3** Which value of $x$ makes the equation $5(e)^{4x} = 25$ true?

**A** $x = \ln\frac{5}{4}$

**B** $x = \frac{1}{4}\ln 2$

**C** $x = \frac{1}{4}\ln 5$

**D** $x = \frac{1}{20}\ln 25$

**4** Angle $\theta$ is in standard position in the $xy$-plane, and $\cos\theta = \frac{3}{\sqrt{58}}$. Point $P$ lies on the terminal side of angle $\theta$ and has coordinates $(x, y)$, where $x$ and $y$ are positive integers less than 10.

What are the coordinates of point $P$?

**A** $(-7, 3)$

**B** $(3, -7)$

**C** $(3, 7)$

**D** $(7, 3)$

**5** An expression is shown.

$$\frac{x^2 + 6x - 10}{x + 2}$$

Which expression is equivalent to the given expression when $x \neq -2$?

**A** $x + 8 + \frac{6}{x + 2}$

**B** $x + 8 - \frac{26}{x + 2}$

**C** $x + 4 - \frac{2}{x + 2}$

**D** $x + 4 - \frac{18}{x + 2}$

**6** An expression is shown.

$$\left(\frac{64}{27}\right)^{-\frac{1}{3}}$$

Using the properties of exponents, the expression can be rewritten as which of the fractions shown?

**A** $-\frac{4}{3}$

**B** $-\frac{3}{4}$

**C** $\frac{3}{4}$

**D** $\frac{4}{3}$

**7** Two common logarithmic functions are described.

Logarithmic function $Q$ is represented by the equation $Q(x) = \log\left(\frac{x}{4}\right)$.

The table shows values of logarithmic function $R$.

| $x$ | $y$ |
|---|---|
| 1 | 0 |
| 10 | 1 |
| 100 | 2 |

Which statement correctly compares the $x$-intercepts and function values for the two functions?

**A** $Q(x)$ has the greater $x$-intercept, and $Q(x) > R(x)$ for all values of $x$.

**B** $Q(x)$ has the greater $x$-intercept, and $Q(x) < R(x)$ for all values of $x$.

**C** $R(x)$ has the greater $x$-intercept, and $Q(x) > R(x)$ for all values of $x$.

**D** $R(x)$ has the greater $x$-intercept, and $Q(x) < R(x)$ for all values of $x$.

**8** The expression $x^3 - 3x^2 - 4x + 12$ can be written as $(x^2 - a)(x - b)$, where $a$ and $b$ are constants.

What are the values of $a$ and $b$?

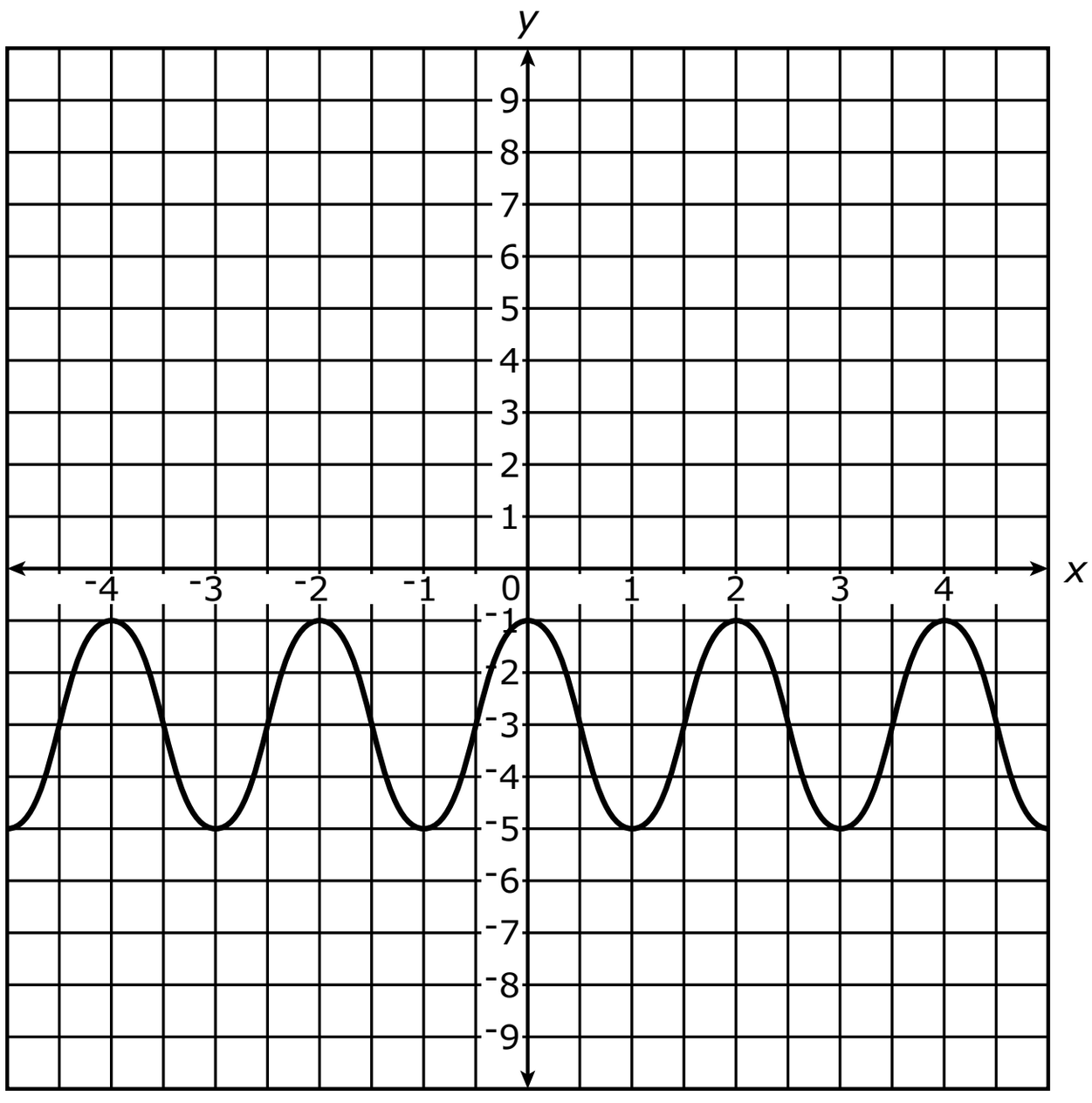
**A** $a = 1$ and $b = 12$

**B** $a = 2$ and $b = 6$

**C** $a = 3$ and $b = 4$

**D** $a = 4$ and $b = 3$

**9** The graph of a function is shown.




Which function could be represented on the graph?

**A** $y = 2\cos(\pi x) - 3$

**B** $y = 2\cos(\pi x) - 1$

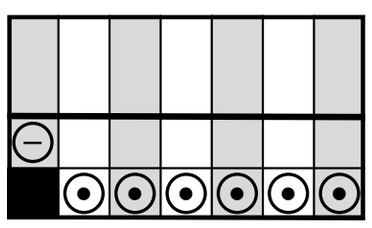
**C** $y = 2\cos\left(\frac{x}{\pi}\right) - 3$

**D** $y = 2\cos\left(\frac{x}{\pi}\right) - 1$

**10** The binomial $(x - 2)$ is a factor of the polynomial function $P(x) = x^3 - x^2 + ax - 6$, where $a$ is a constant.

What is the value of $a$?

Enter your answer in the space provided.



**11** Which list of numbers shows the quantities $4^7$, $(4^6)(4^2)$, and $9^{3.5}$ in order by value from **least** to **greatest**?

**A** $9^{3.5}$, $(4^6)(4^2)$, $4^7$

**B** $9^{3.5}$, $4^7$, $(4^6)(4^2)$

**C** $4^7$, $9^{3.5}$, $(4^6)(4^2)$

**D** $4^7$, $(4^6)(4^2)$, $9^{3.5}$

**12** An equation is shown.

$$\frac{x}{x+6} = \frac{2x-3}{x+12}$$

What are the solutions of the equation?

Select **all** that apply.

**A** $x = -12$

**B** $x = -6$

**C** $x = -3$

**D** $x = 0$

**E** $x = \frac{3}{2}$

**F** $x = 3$

**G** $x = 6$

**13** A solid wooden toy is composed of a hemisphere and a cone with a common radius. The height of the cone is equal to the common radius.

The formula shown represents $V$, the volume, in cubic inches, of the toy in terms of $r$, the common radius, in inches, of the hemisphere and cone.

$$V = \pi r^3$$

Which formula can be used to determine the common radius of the hemisphere and cone if the volume of the toy is known?

**A** $r = \sqrt[3]{\pi V}$

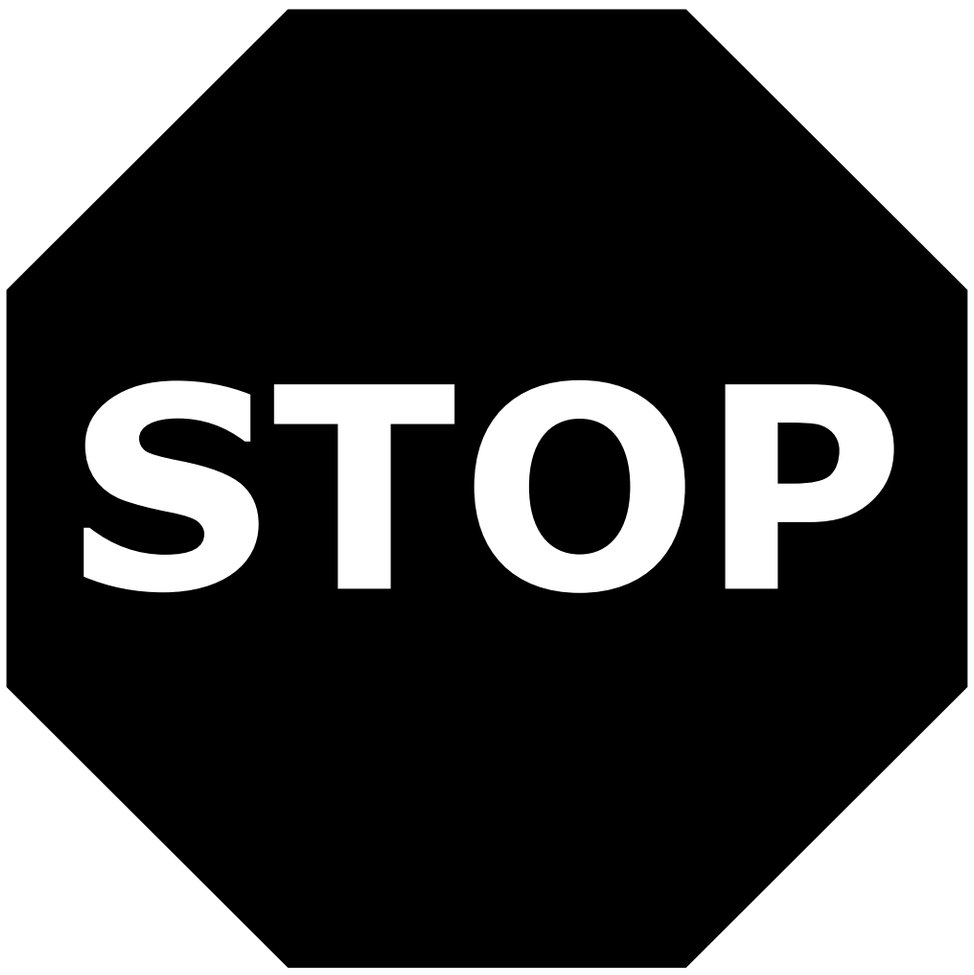
**B** $r = \sqrt[3]{\frac{V}{\pi}}$

**C** $r = \pi V^3$

**D** $r = \left(\frac{V}{\pi}\right)^3$



STOP

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# Section 2
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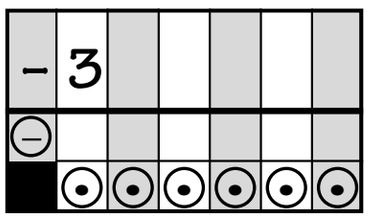


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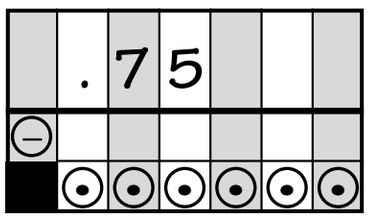
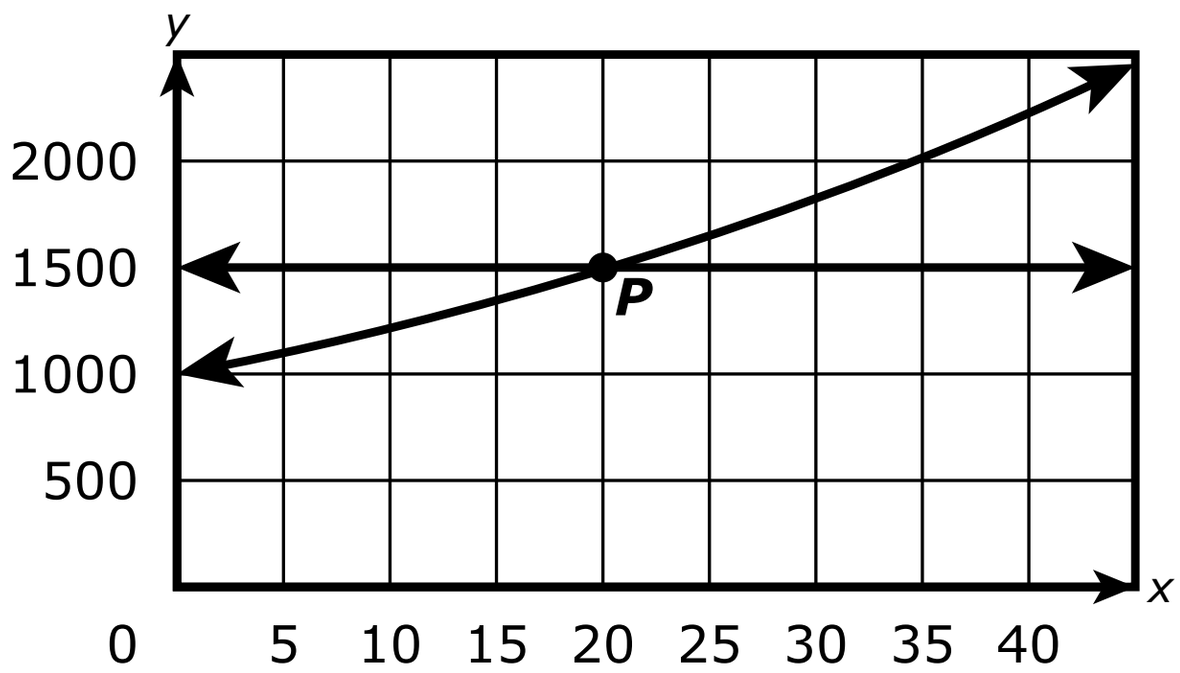


**1** A person opened an account with an initial deposit. The account pays 0.5% interest. The person did not make any additional deposits to the account or withdraw money from the account. The equation $y = 1000(1.005)^{4x}$ models the amount, in dollars, in the account $x$ years after it was opened.

The graph of the model and the graph of the equation $y = 1500$ are shown in the $xy$-coordinate plane.

The intersection of the two graphs is marked with the point $P$.




What is revealed by the coordinates of the point $P$?

**A** the yearly interest rate for the account

**B** the amount of the initial deposit in the account

**C** the number of years it takes for the account value to reach $1500

**D** the number of years it takes for the initial amount in the account to double

**2** The functions $f$ and $g$ are defined as shown.

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

$$g(x) = 0.5x^2 + 1$$

Which intervals include a value of $x$ for which $f(x) = g(x)$?

Select **all** that apply.

**A** $-3 < x \leq -2$

**B** $-2 < x \leq -1$

**C** $-1 < x \leq 0$

**D** $0 < x \leq 1$

**E** $1 < x \leq 2$

**F** $2 < x \leq 3$

**3** The world population in 1997 was 5.88 billion.

The world population in 2017 was 7.53 billion.

Assume that the ratio of the populations in any two consecutive years was constant from 1997 to 2017.

Which equation can be used to find $r$, the rate of growth per year of the world population?

**A** $5.88 = 7.53r^{10}$

**B** $5.88 = 7.53r^{20}$

**C** $7.53 = 5.88r^{10}$

**D** $7.53 = 5.88r^{20}$

**4** Consider the equation $a = \sqrt{x + b}$, where $a$ and $b$ represent real numbers.

Which statement is true about the number of real solutions to the equation?

**A** The number of real solutions depends only on the value of $a$.

**B** The number of real solutions depends only on the value of $b$.

**C** The values of $a$ and $b$ do not affect the number of real solutions.

**D** The number of real solutions depends on the relationship between $a$ and $b$.

**5** A student made the claim shown.

Claim: There is no quadratic equation with real coefficients for which $x = -5i$ is a solution.

- Show that the claim is not correct by providing an example of a quadratic equation for which $x = -5i$ is a solution. Include any other solutions to your equation in your answer.
- Determine if it is possible for a quadratic equation with real coefficients to have $x = -5i$ as its **only** solution. Justify your answer.

Enter your answer and your explanation in the space provided.

**5**

**6** The approximate number of cars parked in a garage $x$ hours after 6:00 a.m. can be modeled by the function $y = 180 + 130\sin\left(\frac{x}{12}\pi\right)$, where $0 \leq x \leq 16$.

Based on the model, for which time interval did the number of cars parked in the garage increase?

**A** 7:00 a.m. to 9:00 a.m.

**B** 1:00 p.m. to 4:00 p.m.

**C** 5:00 p.m. to 7:00 p.m.

**D** 8:00 p.m. to 10:00 p.m.

**7** Consider the system of equations shown.

$$y = (x-3)^2$$
$$y = x - 1$$

On the coordinate plane, what are the coordinates of the points that represent solutions $(x, y)$ of the system?

**A** $(-5, -6)$ and $(-2, -3)$

**B** $(-5, -6)$ and $(2, 1)$

**C** $(5, 4)$ and $(-2, -3)$

**D** $(5, 4)$ and $(2, 1)$

**8** Angle $\theta$ is in standard position in the coordinate plane with the terminal side in the fourth quadrant. The value of $\cos\theta$ is $\frac{12}{13}$.

What is the value of $\tan\theta$?

**A** $-\frac{12}{5}$

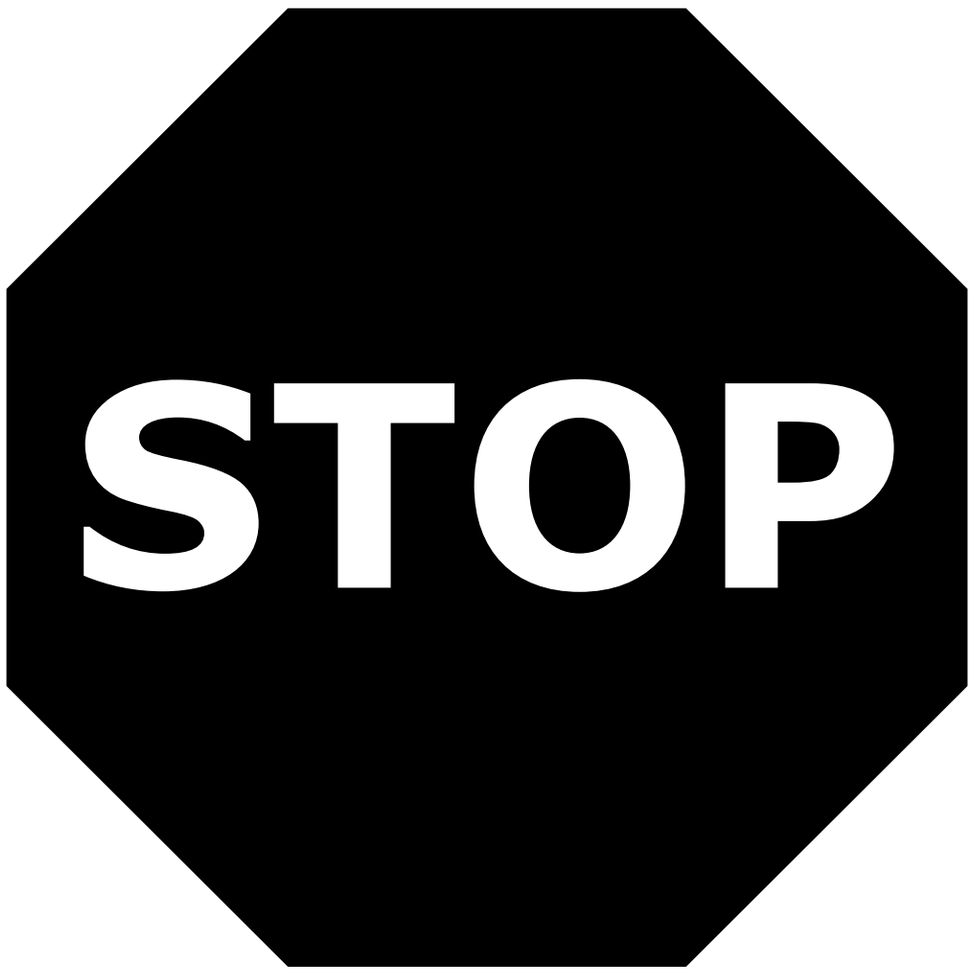
**B** $-\frac{5}{12}$

**C** $\frac{5}{12}$

**D** $\frac{12}{5}$



STOP

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# Section 3
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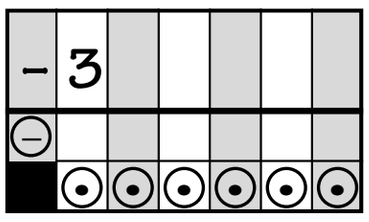


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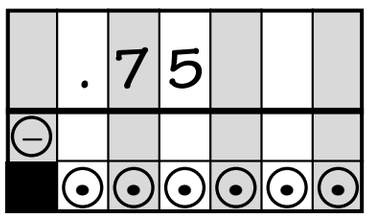


**1** The table shows the percent of U.S. households with computers for selected years between 1984 and 2003.

**Percent of Households with Computers**

| Year | Percent |
|---|---|
| 1984 | 8.2 |
| 1989 | 15.0 |
| 1993 | 22.9 |
| 1997 | 36.6 |
| 2000 | 51.0 |
| 2001 | 56.3 |
| 2003 | 61.8 |

Which equation **best** models the data in the table, where $y$ is the percent of households with computers and $x$ is the number of years after 1980?

**A** $y = 5.6(1.08)^x$

**B** $y = 5.6(1.09)^x$

**C** $y = 5.6(1.11)^x$

**D** $y = 5.6(1.14)^x$

**2** The manager of a new fitness center constructed the model $m(t) = 300 - 280(0.76)^t$ to predict the number of members the fitness center will have $t$ months after the fitness center opens.

- What is the average rate of change, in members per month, in the number of members the fitness center expects to have from the 4th month to the 8th month after opening? Show your work.
- What is the significance of the number 300 in the model? Explain your answer.

Enter your answers and your work and explanation in the space provided.

**2**

**3** A kitchen supply store sells a set of 4 food storage containers.

- From largest to smallest, the volumes of the containers are $v_1$, $v_2$, $v_3$, and $v_4$.
- $v_n$ is 20% less than $v_{n-1}$, where $n$ is 2, 3, or 4.
- $v_n = kv_{n-1}$, where $n$ is 2, 3, or 4.

What is the value of $k$?

**A** $\frac{3}{4}$

**B** $\frac{4}{5}$

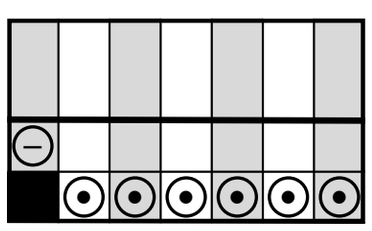
**C** $\frac{5}{4}$

**D** $\frac{4}{3}$

**4** Claim: For every value of the constant $c$, the equation $x^4 + (1 - c^2)x^2 - c^2 = 0$ has at least two distinct real solutions.

What value of $c$ refutes the claim?

Enter your answer in the space provided.



**GO ON TO NEXT PAGE**

**5** Consider the functions $P$ and $Q$, defined as shown.

$$P(x) = x^2 + 7x - 14$$
$$Q(x) = -3x + 10$$

In the $xy$–coordinate plane, what are the coordinates of the points at which the graphs of the equations $y = P(x)$ and $y = Q(x)$ intersect?

Explain how you determined your answer.

Enter your answer and your explanation in the space provided.

**5**

**6** The function shown models $t(x)$, the outside temperature, in degrees Fahrenheit, in a city on a given day $x$ hours after midnight.

$$t(x) = -16\cos\left(\frac{\pi}{12}x\right) + 60$$

On the day represented by the model, the actual temperature at 4:00 p.m. was 63°F.

Which statement correctly compares the actual temperature to the temperature predicted by the model?

**A** The model underpredicted the actual temperature by 11°F.

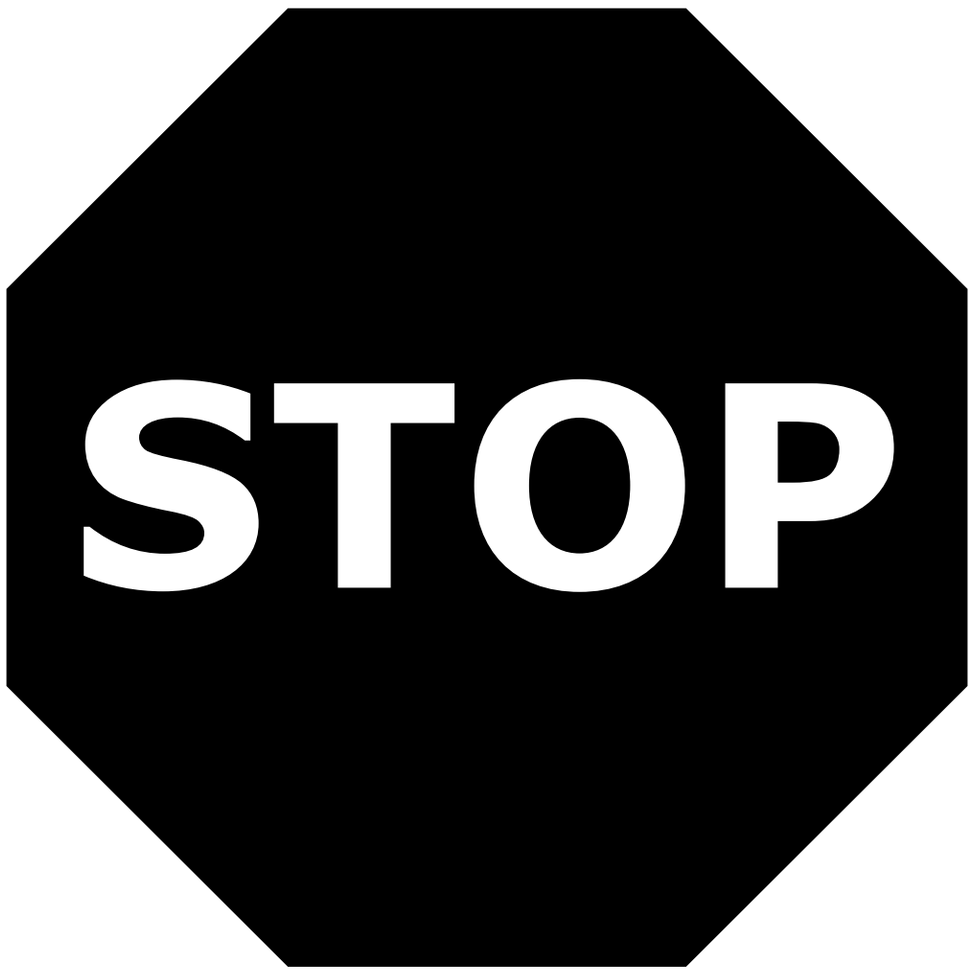
**B** The model underpredicted the actual temperature by 5°F.

**C** The model overpredicted the actual temperature by 11°F.

**D** The model overpredicted the actual temperature by 5°F.



STOP

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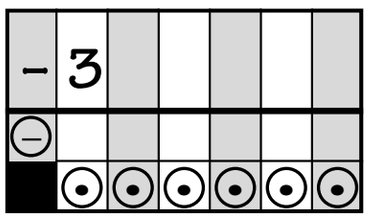


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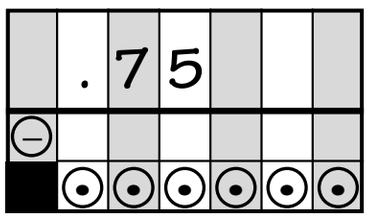


**1** The function $C$ approximates the number of calories recommended per day for a dog, based on the weight, in pounds, of the dog.

The table gives values of $C$ for selected values of $p$, where $C(p)$ represents the recommended number of calories per day for a dog that weighs $p$ pounds.

**Recommended Number of Calories for Dogs**

| $p$ (pounds) | $C(p)$ |
|---|---|
| 11 | 250 |
| 22 | 450 |
| 33 | 750 |
| 44 | 1000 |
| 55 | 1250 |
| 66 | 1500 |
| 77 | 1700 |
| 88 | 1880 |

Which of the equations shown **most** closely approximates $C$?

**A** $C(p) = 18p + 22$

**B** $C(p) = 22p + 18$

**C** $C(p) = 40(1.06)^p$

**D** $C(p) = 48(1.07)^p$

**2** Claim: $\sqrt[3]{x} \leq x$, where $x$ is a real number

For which intervals is the claim true for all values of $x$ in the interval?

Select **all** that apply.

**A** $x > 1$

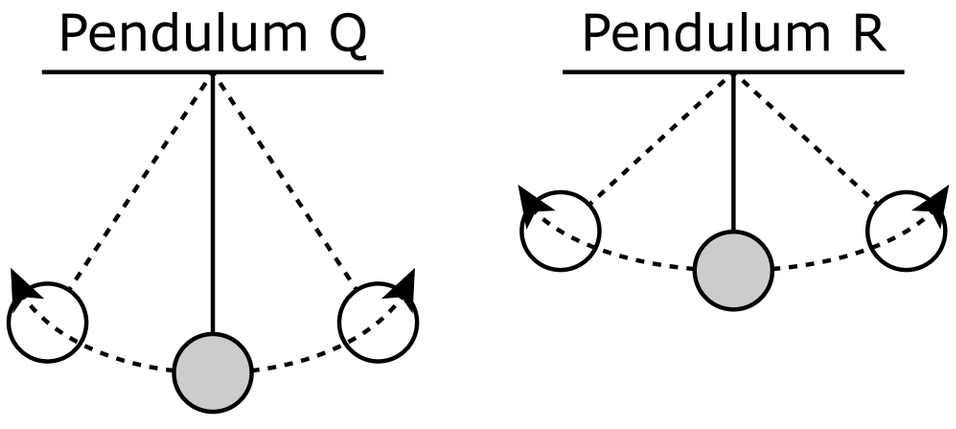
**B** $0 < x < 1$

**C** $-1 < x < 0$

**D** $-2 < x < -1$

**E** $x < -2$

**3** For the two pendulums shown, a weight swings back and forth from left to right. Both pendulums start at the left position at time $t = 0$ seconds.

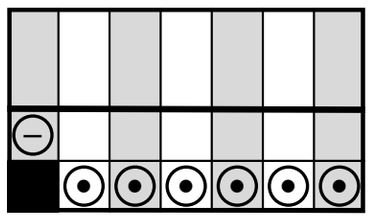



For each pendulum, the horizontal distance, in inches, of the weight from the center position at time $t$ seconds is given by functions $Q$ and $R$, respectively. A negative distance represents the weight being to the left of the center position, and a positive distance represents the weight being to the right of the center position.

$$Q(t) = -6\cos(\pi t)$$
$$R(t) = -4\cos\left(\frac{4}{3}\pi t\right)$$

The maximum horizontal distance of pendulum $Q$ to the right of its starting position is how much greater, in inches, than the maximum horizontal distance of pendulum $R$ to the right of its starting position?

Enter your answer in the space provided.



**4** An equation is shown.

$$\sqrt{x^2 + 19} - 100 = 0$$

What are the solutions of the equation?

**A** $x = 9$ only

**B** $x = 3\sqrt{1109}$ only

**C** $x = -9$ and $x = 9$

**D** $x = -3\sqrt{1109}$ and $x = 3\sqrt{1109}$

**5** The table shows the box office revenue, in millions of dollars, for a new movie in theaters during the opening week and for the following 9 weeks.

**Box Office Revenue for a Movie**

| Number of Weeks after Opening | Box Office Revenue (in millions) |
|---|---|
| 0 | $85.63 |
| 1 | $51.97 |
| 2 | $37.21 |
| 3 | $25.20 |
| 4 | $15.22 |
| 5 | $11.17 |
| 6 | $7.02 |
| 7 | $4.03 |
| 8 | $4.42 |
| 9 | $1.95 |

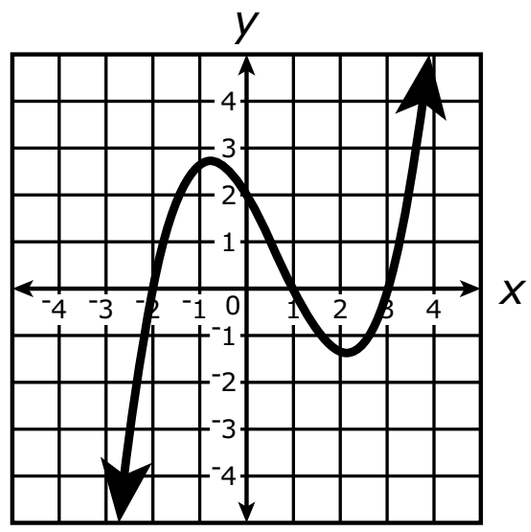
The theaters will stop showing the movie when the weekly box office revenue is less than $100,000.

- Create a function to model the data. Explain why you chose the type of function and explain the meaning of the parameters of the function.
- Use your model to predict the week when the theaters will stop showing the movie.

Enter your answer and your explanation in the space provided.

**5**

**6** Consider the polynomial function $P$, defined by $P(x) = x^3 + cx^2 + x + 2$, where $c$ is a constant, and consider the graph of a curve shown in the $xy$-coordinate plane.




Which statement **best** explains whether the curve shown on the coordinate plane can be the graph of $y = P(x)$ if $P(-2) = 0$?

**A** The curve can be the graph of $y = P(x)$ because $c$ would equal $-2$ and the points (1, 0) and (3, 0) would be on the graph of $y = P(x)$.

**B** The curve can be the graph of $y = P(x)$ because $c$ would equal 2 and the points (1, 0) and (3, 0) would be on the graph of $y = P(x)$.

**C** The curve cannot be the graph of $y = P(x)$ because $c$ would equal $-2$ and the points $(-2, 0)$ and (3, 0) would not be on the graph of $y = P(x)$.

**D** The curve cannot be the graph of $y = P(x)$ because $c$ would equal 2 and the points (1, 0) and (3, 0) would not be on the graph of $y = P(x)$.

**7** When a customer pays with a debit card at a clothing store, the owner pays a processing fee. The function $P$ represents the processing fee, in dollars, for a debit card purchase of $x$ dollars.

$$P(x) = 0.035x + 0.15$$

How is the processing fee calculated based on the purchase amount?

**A** The processing fee consists of a fixed amount of \$0.15 plus 0.35% of the purchase amount.

**B** The processing fee consists of a fixed amount of \$0.15 plus 3.5% of the purchase amount.

**C** The processing fee consists of a fixed amount of \$0.35 plus 1.5% of the purchase amount.

**D** The processing fee consists of a fixed amount of \$0.35 plus 15% of the purchase amount.

**8** The half-life of the isotope Francium-223 is 22 minutes. For a sample that starts with $F$ grams of Francium-223, the expression $F(0.5)^{\frac{m}{22}}$ represents the number of grams remaining after $m$ minutes.

Which expression represents the number of grams of Francium-223 remaining after $h$ hours?

**A** $F(0.151)^{h}$

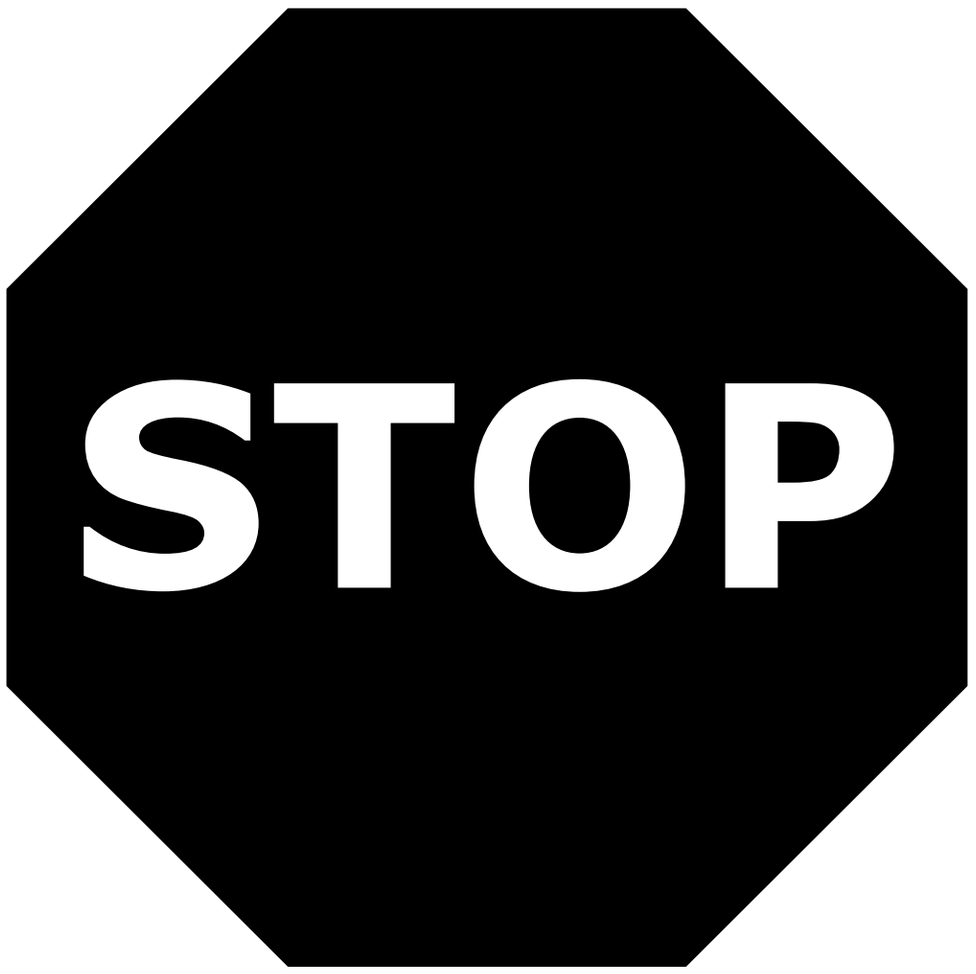
**B** $F(0.5)^{\frac{h}{60}}$

**C** $F(0.5)^{60h}$

**D** $F(0.969)^{h}$



STOP




**You have come to the end of Section 4 of the test. Review your answers from Section 4 only.**

P

# ALG-II

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