

- 1 Which equation models a translation of the equation below 2 units right and 4 units down?
 $x^2 + y^2 = 25$

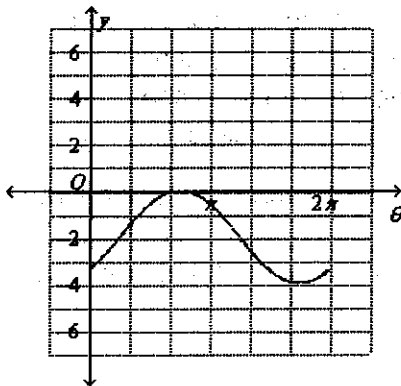
- A $(x + 2)^2 + (y + 4)^2 = 25$
- B $(x - 2)^2 + (y + 4)^2 = 25$
- C $(x + 2)^2 + (y - 4)^2 = 25$
- D $(x - 2)^2 + (y - 4)^2 = 25$

- 2 Find the period, range, and amplitude of the cosine function.

$$y = \frac{3}{2} \cos \frac{t}{2}$$

- A period = 4π , range: $-\frac{3}{2} \leq y \leq \frac{3}{2}$, amplitude = $\frac{3}{2}$
- B period = $\frac{1}{2}$, range: $-\frac{3}{2} \leq y \leq \frac{3}{2}$, amplitude = $-\frac{3}{2}$
- C period = 4π , range: $-\frac{3}{2} \leq y \leq \frac{3}{2}$, amplitude = $-\frac{3}{2}$
- D period = $\frac{1}{2}$, range: $y \leq \frac{3}{2}$, amplitude = $\frac{3}{2}$

- 3 What is the equation of the cosine function shown below?



- A $y = -2 \cos(\theta + \frac{3\pi}{4}) - 2$
- B $y = 2 \cos(\theta - \frac{3\pi}{4}) - 2$
- C $y = -2 \cos(\theta + \frac{3\pi}{4}) - 2$
- D $y = 2 \cos(\theta + \frac{3\pi}{4}) - 2$

- 4 Suppose a is an arithmetic sequence with initial term $a(0) = -10$ and a common difference of 10. Find $a(19)$.

- A 180
- B 170
- C 190
- D 19

- 5 Graph the system of equations. Find all solutions if $0^\circ \leq x \leq 360^\circ$.

$$y = 0.3$$

$$y = \cos x$$

- A $17^\circ, 343^\circ$
- B $73^\circ, 287^\circ$
- C $73^\circ, 163^\circ$
- D $17^\circ, 107^\circ$

- 6 What is the equation in standard form of an ellipse that has a vertex at $(-5, 0)$, a co-vertex at $(0, 4)$, and is centered at the origin?

- A $\frac{x^2}{25} + \frac{y^2}{16} = 1$
- B $\frac{x^2}{16} + \frac{y^2}{25} = 1$
- C $\frac{x^2}{5} + \frac{y^2}{4} = 1$
- D $\frac{x^2}{4} + \frac{y^2}{5} = 1$

- 7 Find the outlier in the data set.
6.8, 4.6, 6.7, 0.4, 6.2, 4.8, 3.7, 3.1

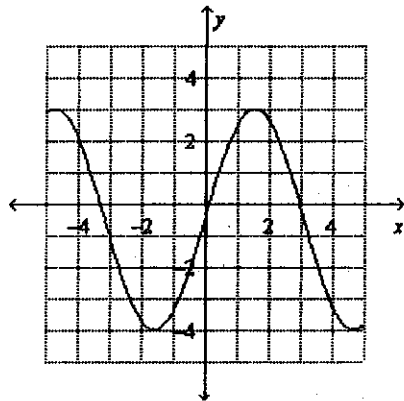
- A 3.7
- B 3.1
- C 0.4
- D 6.8

8 Find the range and interquartile range of the data. Round to the nearest tenth.

259, 125, 158, 168, 187, 334, 198

- A range = 176; interquartile range = 72
- B range = 209; interquartile range = 72
- C range = 176; interquartile range = 101
- D range = 209; interquartile range = 101

9 Find the amplitude of the periodic function.



- A 3.5
- B 3
- C 7
- D 1.75

10 Solve the equation. Check the solution.

$$\frac{5}{6w} + \frac{1}{w} = -4$$

- A $-\frac{3}{14}$
- B $\frac{11}{6}$
- C $-\frac{11}{24}$
- D $-\frac{31}{24}$

- 11 Choose the explicit formula for the sequence. Then find the fifth term in the sequence.

$$a_1 = 120, r = 0.3$$

- A $a_n = 120 \cdot (0.3)^n; 0.2916$
- B $a_n = a_{n-1} \cdot 0.3; 0.2916$
- C $a_n = 120 \cdot (0.3)^n; 0.972$
- D $a_n = 120 \cdot (0.3)^{n-1}; 0.972$

- 12 The sequence 15, 21, 27, 33, 39, ..., 75 has 11 terms. Evaluate the related series.

- A 420
- B 495
- C 210
- D 480

- 13 Which explicit formula models the sequence 7, 2, -3, -8, -13, ...? Find the following.

$$a_{14}$$

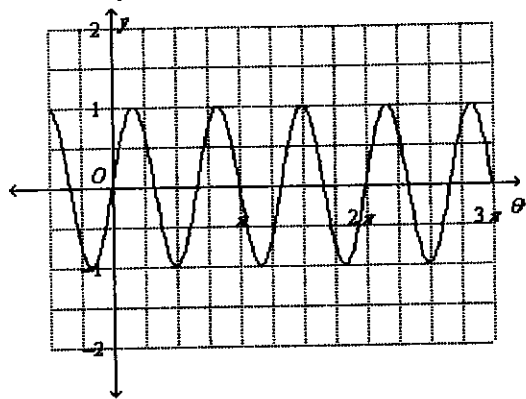
- A $a_n = -5n + 12; -53$
- B $a_n = -5n + 7; -58$
- C $a_n = -5n + 12; -58$
- D $a_n = -5n + 7; -63$

- 14 Find the exact value of the sine of the angle given.

$$\left(-\frac{4\pi}{3} \text{ radians}\right)$$

- A $\frac{1}{2}$
- B $\sqrt{3}$
- C 1
- D $\frac{\sqrt{3}}{2}$

- 15 Find the period of the graph shown below.



- A 2π
- B $\frac{2}{3}\pi$
- C $\frac{1}{2}\pi$
- D 4π

- 16 Identify the vertex, focus, and directrix of the graph of the equation.

$$y = \frac{1}{8}(x - 2)^2 + 5$$

- A vertex (2, 5), focus (2, 7), directrix at $y = 3$
- B vertex (2, -5), focus (0, 7), directrix at $y = -2$
- C vertex (-2, -5), focus (0, 2), directrix at $y = 2$
- D vertex (-2, 5), focus (2, -2), directrix at $y = 3$

- 17 Does the infinite geometric series diverge or converge? Explain.

$$\frac{1}{5} + \frac{1}{10} + \frac{1}{20} + \frac{1}{40} + \dots$$

- A It diverges; it has a sum.
- B It diverges; it does not have a sum.
- C It converges; it has a sum.
- D It converges; it does not have a sum.

18 Find the values of the 30th and 90th percentiles of the data.
18, 9, 7, 5, 11, 7, 17, 20, 19, 2, 17, 12, 5, 1, 13, 12, 11, 15, 16, 20

- A 30th percentile = 9;
90th percentile = 20
- B 30th percentile = 9;
90th percentile = 19
- C 30th percentile = 11;
90th percentile = 19
- D 30th percentile = 7;
90th percentile = 20

19 Find the arithmetic mean given below.

$$a_x$$

Given:

$$a_{x-1} = \frac{5}{7} \quad a_{x+1} = \frac{9}{4}$$

- A $\frac{83}{56}$
- B $\frac{5}{4}$
- C $\frac{83}{28}$
- D $\frac{7}{4}$

20 Find the missing term in the geometric sequence.

1250, ?, 50, ...

- A 1200
- B 650
- C 250
- D 125

21 For the series, find the number of terms.

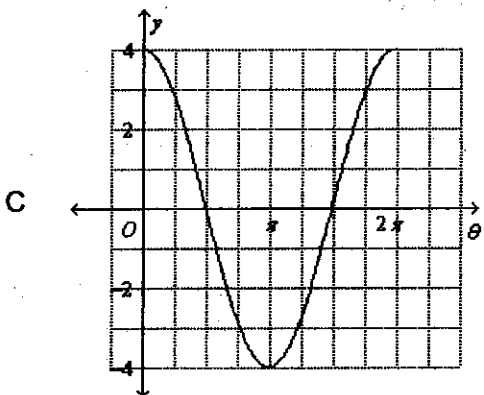
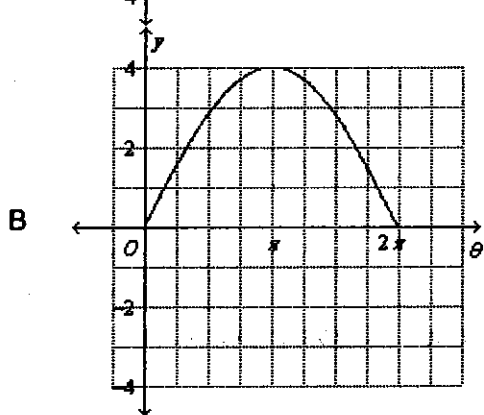
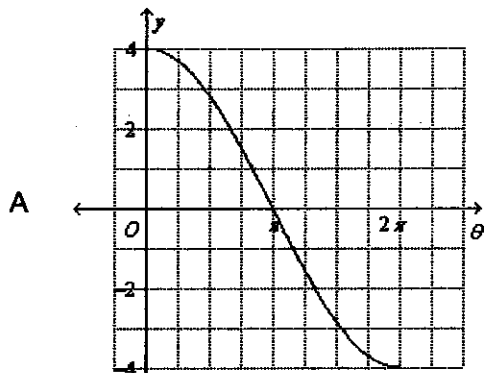
$$\sum_{n=1}^8 4n$$

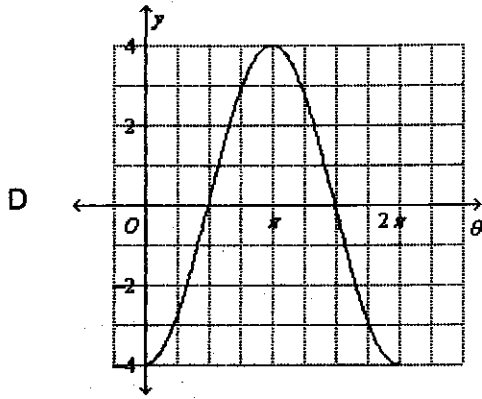
- A 7 terms
- B 16 terms
- C 8 terms
- D 9 terms

22 Which graph shows the function?

$$y = 4 \cos \frac{1}{2} \theta$$

Interval:
0 to 2π





23 Simplify the complex fraction.

$$\frac{\frac{4}{x+3}}{\frac{1}{x}+3}$$

- A $\frac{12x+4}{x^2+3x}$
- B $\frac{4x}{3x+9}$
- C $\frac{4x}{3x^2+10x+3}$
- D not here

24 Which image correctly displays the asymptotes and graph of the function?

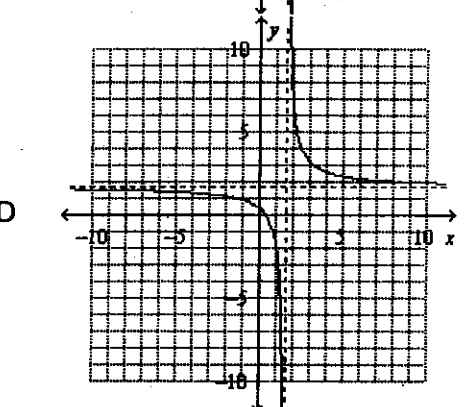
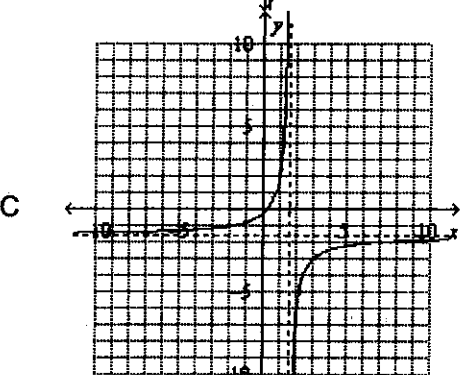
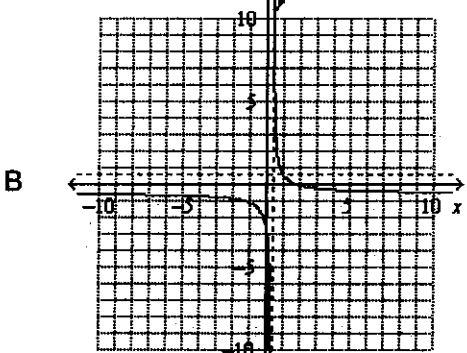
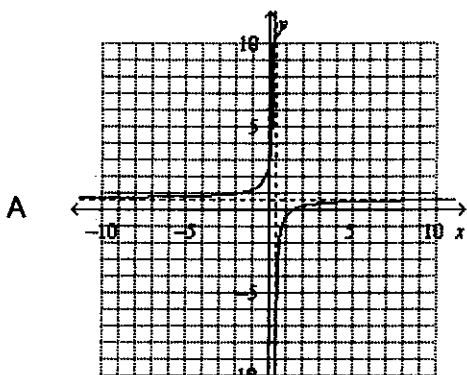
$$y = \frac{-3x + 5}{-5x + 2}$$

vertical asymptote

=

horizontal asymptote

=



- 25 The table shows the results of a survey of students in two math classes.
Find $P(\text{more than 1 hour of TV} \mid \text{6th period class})$. Round to the nearest thousandth.

	Yes	No
3rd period class	11	6
6th period class	13	10

- A 0.647
 B 0.565
 C 0.435
 D 0.765
- 26 What is 45° in radians? Express your answer in terms of π .
- A $\frac{\pi}{4}$
 B $\frac{9\pi}{20}$
 C $\frac{\pi}{6}$
 D $\frac{\pi}{8}$
- 27 What is the equation of a cosine function with the amplitude of 2 and the period given below?
 4π

- A $y = -\frac{1}{2} \cos\left(\frac{1}{2}x\right)$
 B $y = \frac{1}{2} \cos\left(\frac{1}{4}x\right)$
 C $y = 2 \cos\left(\frac{1}{2}x\right)$
 D $y = -2 \cos\left(\frac{1}{4}x\right)$

28 Evaluate the sum.

$$\sum_{n=2}^7 (4n - 3)$$

- A 93
- B 91
- C 108
- D 90

29 Multiply. State any restrictions on the variables.

$$\frac{z^2}{z+1} \cdot \frac{z^2 + 3z + 2}{z^2 + 3z}$$

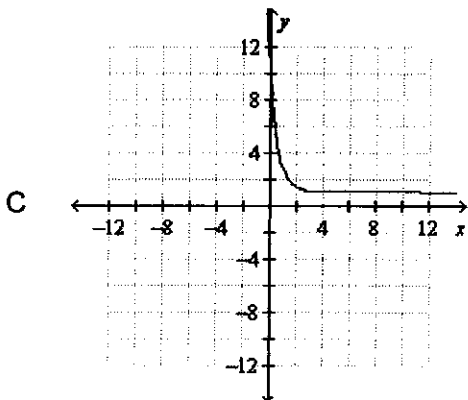
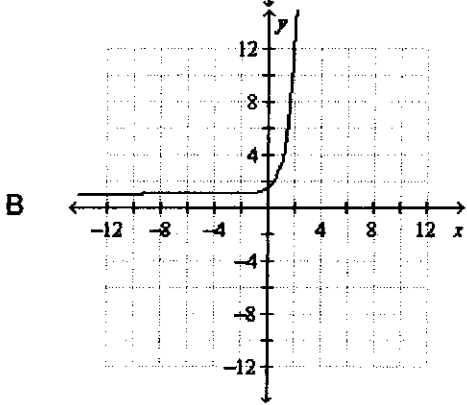
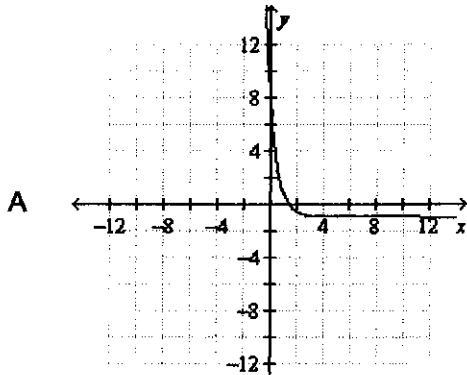
- A $\frac{z^2 + 2z}{z + 3}, z \neq -1, -3$
- B $\frac{z + 2}{z + 3}, z \neq -1, 0, -3$
- C $\frac{z + 2}{z + 3}, z \neq -1, -3$
- D $\frac{z^2 + 2z}{z + 3}, z \neq -1, 0, -3$

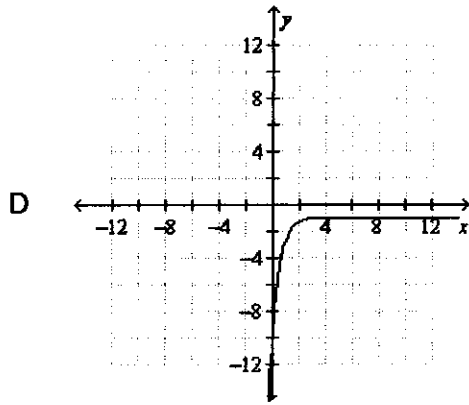
30 What is the graph of the equation?

$$y = 2\left(\frac{1}{5}\right)^{x-1} + 1$$

Is it growth or decay?

Identify any shifts and or reflections.

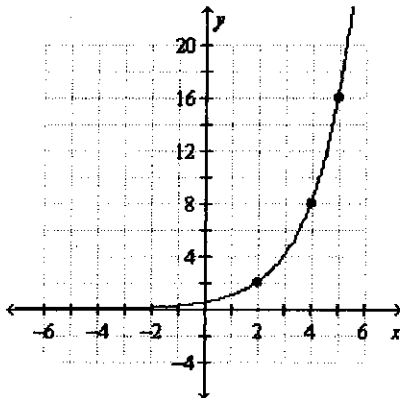




31 Is the sequence arithmetic? If so, identify the common difference.
 -2.4, 9.8, 22, 34.2, ...

- A yes, 12
- B yes, 12.2
- C yes, 12.3
- D no

32 Which exponential function is modeled by the graph?



*put points in
stat, edit,
do an exponential
regression.*

- A $y = 0.5(2)^x$
- B $y = 2(0.5)^x$
- C $y = (2 \cdot 0.5)^x$
- D $y = 2(5)^x$

- 33 Find the range of the function using the natural domain.

$$f(x) = \frac{1}{x-4} + 7$$

- A all real numbers other than -7
- B all real numbers other than 7
- C all real numbers other than -4
- D all real numbers other than 4

- 34 Simplify the rational expression.

$$\frac{x^2 + 4x - 21}{x^2 + x - 42}$$

- A $\frac{x-3}{x-6}$
- B $\frac{x+3}{x+6}$
- C $\frac{x+7}{x+6}$
- D $\frac{x-3}{x+7}$

- 35 A set of data with a mean of 56 and a standard deviation of 3.3 is normally distributed. Find the values that are 2 standard deviations from the mean.

- A -6.6 and 62.6
- B 6.6 and 62.6
- C -6.6 and 6.6
- D 49.4 and 62.6

- 36 Identify the conic section. If it is a parabola, give the vertex. If it is a circle, give the center and radius. If it is an ellipse or a hyperbola, give the center and foci.

$$4x^2 + 7y^2 + 32x - 56y + 148 = 0$$

- A ellipse with center $(4, -4)$, foci at $(4 \pm \sqrt{3}, -4)$
- B hyperbola with center $(-4, -4)$, foci at $(4, -4 \pm \sqrt{3})$
- C ellipse with center $(-4, 4)$, foci at $(-4 \pm \sqrt{3}, 4)$
- D hyperbola with center $(4, 4)$, foci at $(-4, 4 \pm \sqrt{3})$

- 37 Find the center and radius of the circle with the equation?

$$(x - 5)^2 + (y + 6)^2 = 9$$

- A (5, -6); 3
- B (-5, 6); 9
- C (5, -6); 9
- D (-5, 6); 3

- 38 Use a graphing calculator to graph the function.

$$g(x) = -x^2 - 3x + 7$$

Find the area under the curve for the domain below.

$$-4 \leq x \leq 1$$

- A $71.\bar{6}$ square units
- B 46 square units
- C $35.8\bar{3}$ square units
- D $17.91\bar{6}$ square units

- 39 Each person in a group of students was identified by year and asked when he or she preferred taking classes: in the morning, afternoon, or evening. The results are shown in the table. Find the probability that the student preferred afternoon classes given he or she is a junior. Round to the nearest thousandth.

	Freshman	Sophomore	Junior	Senior
Morning	19	2	6	16
Afternoon	17	3	13	15
Evening	8	14	9	7

- A 0.571
- B 0.464
- C 0.342
- D 0.158

- 40 Find the mean, median, and mode of the data set. Round to the nearest tenth.

15, 13, 9, 9, 7, 1, 11, 10, 13, 1, 13

- A mean = 9.3, median = 8, mode = 13
- B mean = 8.5, median = 10, mode = 13
- C mean = 9.3, median = 10, mode = 13
- D mean = 8.5, median = 10, mode = 8

- 41 Is the sequence arithmetic? If so, identify the common difference.

13, 20, 27, 34, ...

- A yes, 7
- B yes, -7
- C yes, 13
- D no

- 42 Divide. State any restrictions on the variable.

$$\frac{c+1}{c-5} \div \frac{c-2}{c^2-7c+10}$$

- A $\frac{c+1}{(c-5)^2}, c \neq 5, 2$
- B $c+1, c \neq 5, 2$
- C $c+1, c \neq 2, -2$
- D $\frac{c+1}{(c-5)^2}, c \neq 5, 2$

- 43 Find the mean and standard deviation of the data set. Round to the nearest tenth.

62, 37, 48, 67, 44, 58, 47, 47

- A mean = 51.3;
standard deviation = 9.4
- B mean = 51.3;
standard deviation = 88.9
- C mean = 47.5;
standard deviation = 9.4
- D mean = 47.5;
standard deviation = 88.9

- 44 Find any points of discontinuity for the rational function.

$$y = \frac{x - 8}{x^2 + 6x - 7}$$

- A $x = 1, x = 7$
- B $x = 8$
- C $x = 1, x = -7$
- D $x = -1, x = 7$

- 45 Describe the vertical asymptote(s) and hole(s) for the graph of the function.

$$y = \frac{(x - 5)(x - 2)}{(x - 2)(x + 4)}$$

- A asymptote: $x = -4$ and hole: $x = 2$
- B asymptotes: $x = -4$ and $x = 2$
- C asymptote: $x = -5$ and hole: $x = -4$
- D asymptote: $x = 4$ and hole: $x = -2$

Horizontal asymptotes?

- 46 Divide. State any restrictions on the variable.

$$\frac{x^2 - 16}{x^2 + 5x + 6} \div \frac{x^2 + 5x + 4}{x^2 - 2x - 8}$$

- A $\frac{(x - 4)^2}{(x + 3)(x + 1)}$; $x \neq -3, -1$
- B $\frac{(x + 4)^2(x + 1)}{(x + 2)^2(x + 3)}$; $x \neq -3, -2, 4$
- C $\frac{(x - 4)^2}{(x + 3)(x + 1)}$; $x \neq -4, -3, -2, -1, 4$
- D $\frac{1}{(x + 3)(x + 1)}$; $x \neq -4, -3, -2, -1, 4$

- 47 Solve the equation. Check the solution.

$$\frac{g + 4}{g - 2} = \frac{g - 5}{g - 8}$$

- A $-\frac{22}{3}$
- B 22
- C -22
- D 14

48 Which equation describes a parabola?

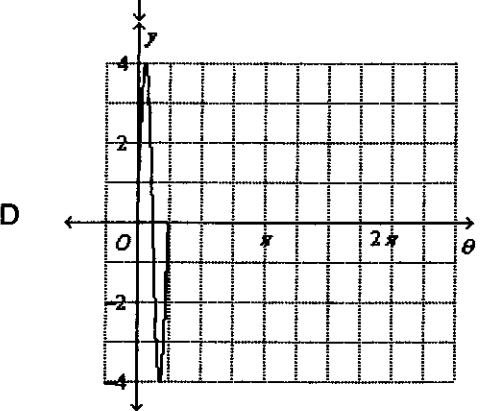
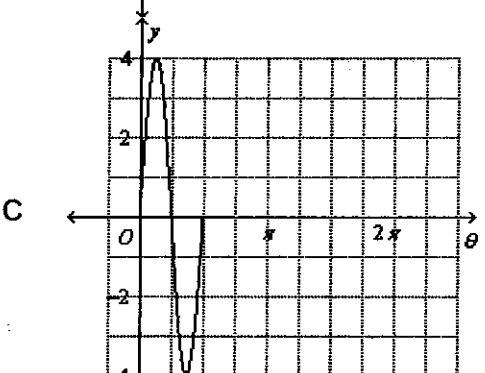
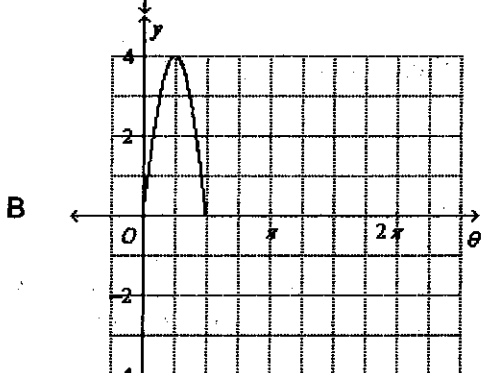
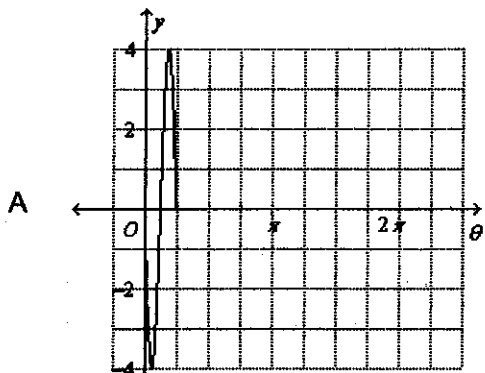
- A $-2y^2 + 10x + 9y = -11$
- B $-4x^2 + 10x - 4y^2 - 2y + 9 = 0$
- C $3y^2 + 10y - 8x^2 - 4x - 2 = 0$
- D $-2x^2 + 10x - 4y^2 + 9y = 2$

49 A grocery store will only accept yellow onions that are at least 3 in. in diameter. A grower has a crop of onions with diameters that are normally distributed, with a mean diameter of 3.25 in. and a standard deviation of 0.25 in. What percent of the onions will be accepted by the grocery store?

- A 34%
- B 97.5%
- C 84%
- D 50%

50 Which graph shows one cycle of the function?

$$y = 4 \sin 4\theta$$



51 Evaluate the series.

$$\sum_{n=3}^8 5n$$

- A 125
- B 38
- C 210
- D 165

52 Evaluate the series $1 + 2 + 4 + 8$ to S_{10} .

- A 256.5
- B 511
- C 1023
- D 2047

53 Use a graphing calculator to solve the equation.

$$3 \tan \frac{1}{3} \theta = 8$$

Interval:

0 to 2π

Round your answers in radians to the nearest hundredth.

- A 1.21, 4.35
- B 3.64
- C 1.21, 2.26, 3.31, 4.35, 5.40
- D 0.404, 1.452, 3.55, 4.59, 5.64

54 Write the following using \sum notation.

$$10 + 20 + 30 + 40 + 50 + \dots + 390 + 400$$

- A $\sum_{i=1}^{39} 10(i-1)$
- B $\sum_{i=1}^{39} 10i$
- C $\sum_{i=1}^{40} 7^i$
- D $\sum_{i=1}^{40} 10i$

55 Express the series $2 + 4 + 6 + 8 + \dots$ for 10 terms in summation notation.

A $\sum_{n=1}^{10} 2n$

B $\sum_{n=1}^{10} (n + 2)$

C $\sum_{n=1}^{10} n$

D $\sum_{n=0}^{10} 2n$

56 Which equation models the translation 3 units down of $y = \sin x$?

A $y = \sin(x + 3)$

B $y = \sin(x - 3)$

C $y = \sin x + 3$

D $y = \sin x - 3$

57 Identify the conic section. If it is a parabola, give the vertex. If it is a circle, give the center and radius. If it is an ellipse or a hyperbola, give the center and foci.

$$y^2 - 4x + 6y + 29 = 0$$

A parabola; vertex $(-5, 3)$

B parabola; vertex $(5, -3)$

C parabola; vertex $(5, 4)$

D parabola; vertex $(4, 3)$

- 58 Use the frequency table. Find the probability that a person goes to the movies at least 8 times a month. Round to the nearest thousandth.

Trips to the Movies

Number of Movies	Number of Moviegoers
More than 7 movies per month	123
5–7 movies per month	133
2–4 movies per month	265
Less than 2 movies per month	226
Total	747

- A 0.165
B 0.883
C 0.343
D 0.697
- 59 What is the following radian measure in degrees?

$$\frac{3\pi}{5}$$

- A $108\pi^\circ$
B $\frac{\pi}{300}^\circ$
C 108°
D 1.88°

- 60 What is the equation of a circle with center $(-5, -8)$ and radius 2?

- A $(x - 5)^2 + (y - 8)^2 = 2$
B $(x + 5)^2 + (y + 8)^2 = 4$
C $(x - 5)^2 + (y - 8)^2 = 4$
D $(x + 5)^2 + (y + 8)^2 = 2$

61 Find the annual percent increase or decrease that the equation models.

$$y = 0.35(2.3)^x$$

- A 230% increase
- B 130% increase
- C 30% decrease
- D 65% decrease

62 Is the formula *explicit* or *recursive*?

$$a_n = -4n(n - 1)$$

Find the first five terms of the sequence.

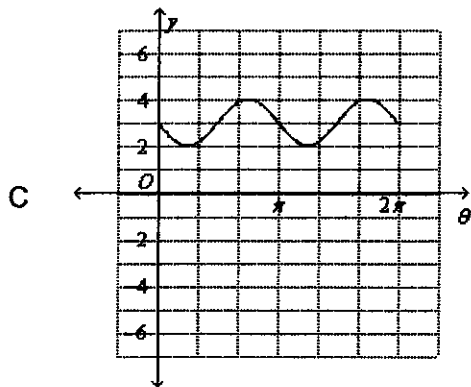
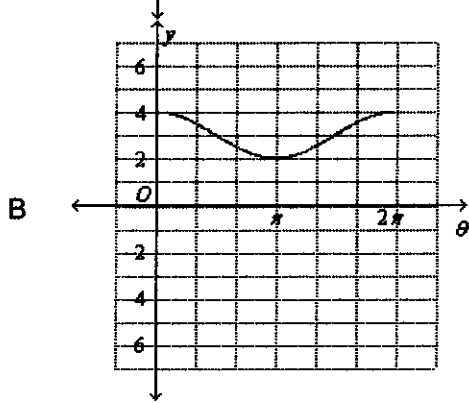
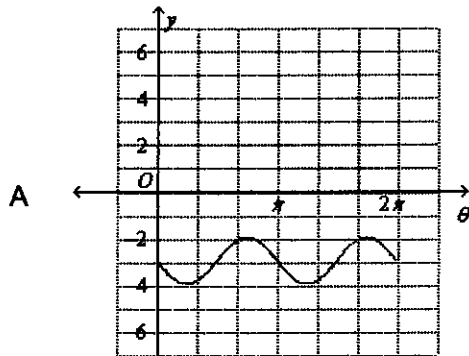
- A recursive; 1, -4, 16, -64, 256
- B recursive; 0, -16, -24, -48, -80
- C explicit; 1, -4, 16, -64, 256
- D explicit; 0, -8, -24, -48, -80

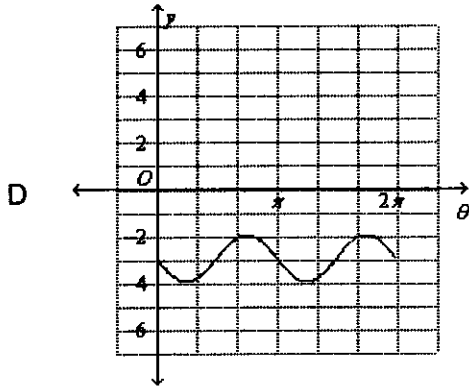
63 Which graph shows the function?

$$y = \sin 2\left(x + \frac{\pi}{2}\right) + 3$$

Interval:

0 to 2π





- 64 Choose the exponential function in the form shown for a graph that includes (1, 15) and (0, 6).

$$y = ab^x$$

use an exponential regression.

- A $y = 6(2.5)^x$
- B $y = 3(5)^x$
- C $y = 2.5(6)^x$
- D $y = 5(3)^x$

- 65 Identify the conic section. If it is a parabola, give the vertex. If it is a circle, give the center and radius. If it is an ellipse or a hyperbola, give the center and foci.

$$8x^2 - 6y^2 + 48x - 24y = 0$$

- A hyperbola with center (3, 2), foci at $(2 \pm \sqrt{14}, 3)$
- B ellipse with center (-3, 2), foci at $(-3, 2 \pm \sqrt{14})$
- C ellipse with center (3, -2), foci at $(3, -2 \pm \sqrt{14})$
- D hyperbola with center (-3, -2), foci at $(-3 \pm \sqrt{14}, -2)$

- 66 Identify the conic section. If it is a parabola, give the vertex. If it is a circle, give the center and radius. If it is an ellipse or a hyperbola, give the center and foci.

$$x^2 + y^2 + 8x - 4y = -11$$

- A circle; center (-4, 2); radius = 9
- B circle; center (4, -2); radius = 9
- C circle; center (-4, 2); radius = 3
- D circle; center (4, -2); radius = 3

67 Which recursive formula models the sequence 8, 10, 12, 14, 16, ...? Find the next term.

- A $a_n = a_{n-1} + 2$, where $a_1 = 8$; 18
- B $a_n = a_{n-1} + 2$, where $a_1 = 18$; 8
- C $a_n = a_{n-1} - 2$, where $a_1 = 8$; 18
- D $a_n = a_{n-1} - 2$, where $a_1 = 2$; -2

68 In any data set, 68% of the data _____ falls within one standard deviation of the mean.

- A always
- B sometimes
- C never

69 The scores on an exam are normally distributed, with a mean of 77 and a standard deviation of 10. What percent of the scores are greater than 87?

- A 68%
- B 16%
- C 84%
- D 2.5%

70 Find the exact value of $\cos 300^\circ$ and $\sin 300^\circ$.

- A $\cos = -\frac{1}{2}$, $\sin = \frac{\sqrt{3}}{2}$
- B $\cos = \frac{1}{2}$, $\sin = -\frac{\sqrt{3}}{2}$
- C $\cos = -\frac{\sqrt{3}}{2}$, $\sin = \frac{1}{2}$
- D $\cos = \frac{\sqrt{3}}{2}$, $\sin = -\frac{1}{2}$

71 What is 320° in radians? Express your answer in terms of π .

- A $\frac{16\pi}{9}$
- B $\frac{9\pi}{16}$
- C $\frac{9}{16\pi}$
- D $\frac{16}{9\pi}$

72 Find the exact values of the following.

$$\cos\left(\frac{3\pi}{4} \text{ radians}\right)$$

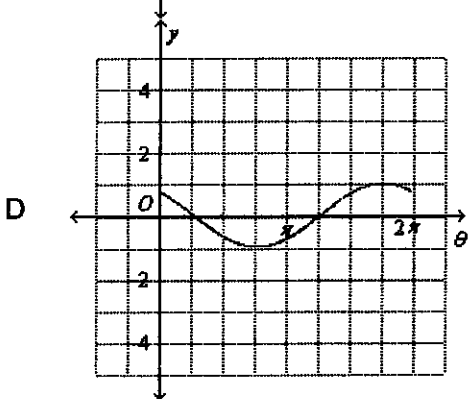
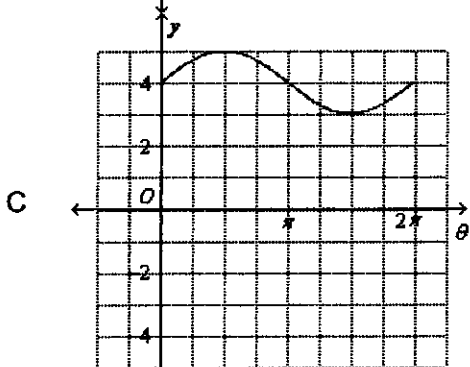
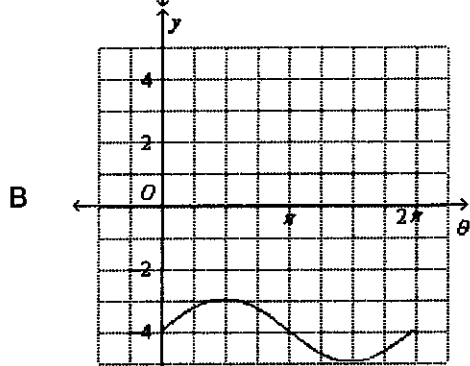
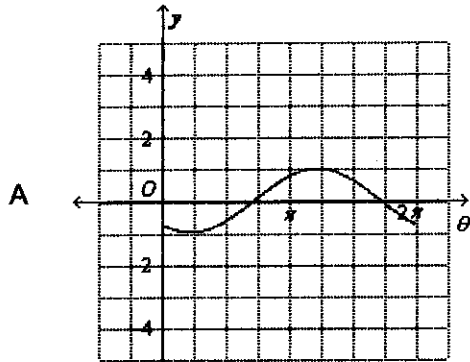
$$\sin\left(\frac{3\pi}{4} \text{ radians}\right)$$

- A $\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}$
- B $-\frac{1}{2}, \frac{\sqrt{3}}{2}$
- C $-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}$
- D $-\frac{\sqrt{3}}{2}, \frac{1}{2}$

73 Which graph shows the function?

$$y = 4 \cos \frac{1}{2} \theta$$

Interval:
0 to 2π



74 Which recursive formula models the sequence 15, 26, 48, 92, 180, ...? Find the next term.

- A $a_n = 2a_{n-1} - 4$, where $a_1 = 15$; 356
- B $a_n = 2a_n - 4$, where $a_1 = 15$; 356
- C $a_n = 4 + 11 \cdot 2^{n-1}$, where $a_1 = 15$; 356
- D $a_n = 3a_{n-1} - 19$, where $a_1 = 15$; 356