Complex Number Problems

Name: _____ **Date:** _____

1. Express $3\sqrt{-27}$ in terms of i.

   A. $9i\sqrt{3}$ B. $6i\sqrt{3}$ C. $-9i$ D. $27i$

2. Simplify: $i^4 + i^2$

   A. 0 B. 1+i C. 1-i D. 2i

3. Add: $\sqrt{-9} + \sqrt{-16}$

   A. $7i$ B. $-7i$ C. $5 + i$ D. $5 - i$

4. If $(a + bi) + (2 + i) = 5 - i$, find the value of b.

   A. $\frac{1}{2}$ B. 1 C. 0 D. -2

5. Express the product in standard form.

   $(3 - \sqrt{-49})(2 + \sqrt{-9})$

   A. $27 - 5i$ B. $-15 - 5i$ C. $-15 + 5i$ D. $27 + 5i$

6. Solve for x given $x^2 + 18 = 8x$

   A. $4 \pm i$ B. $4 \pm 2\sqrt{2}$ C. $-4 \pm i\sqrt{2}$ D. $4 \pm i\sqrt{2}$

7. Find the roots of the equation $3x^2 + 5x + 4 = 0$

   A. $\frac{-5 \pm i\sqrt{23}}{6}$ B. $\frac{-5 \pm \sqrt{13}}{2}$ C. $\frac{5 \pm 4i\sqrt{3}}{12}$ D. $-5 \pm \frac{i\sqrt{23}}{2}$

8. An example of an equation which has *no* real root is:

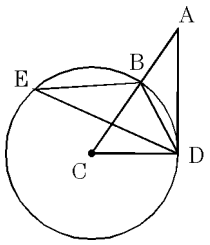
   A. $2x^2 - 5x - 8 = 0$ B. $2x^2 = 5x$ C. $2x^2 + 5x - 8 = 0$ D. $2x^2 - 5x + 8 = 0$

Geometry Practice Problems

Name: _____ **Date:** _____

1. Given: $\overline{AD}$ is tangent to the circle at D
   $\triangle BCD$ is an equilateral triangle

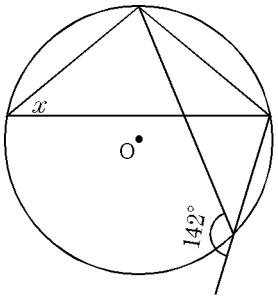
   Prove: $m\angle BED = m\angle CAD$



statement	reason
1. _____	Given
2. _____ $= 60^\circ$	Each angle of an equilateral triangle is 60°
3. _____ $= 30^\circ$	_____
4. _____	Given
5. $\overline{AD} \perp \overline{CD}$	_____
6. $m\angle ADC = 90^\circ$	_____
7. _____	_____
8. $m\angle BED = m\angle CAD$	_____

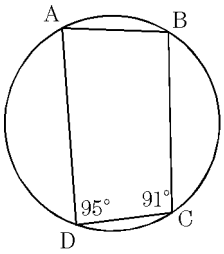
2. Find the value of x.

   A. 38° B. 42° C. 71° D. 142°



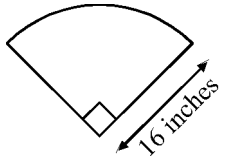
3. What is the measure, in degrees, of $\angle A$?

   A. 85 B. 89 C. 95 D. 99



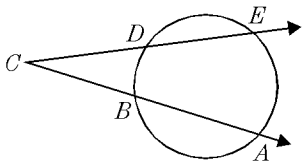
4. A decorative window is in the shape of a quarter circle. What is the approximate area of the pane of glass in the window? [$\pi \approx 3.14$]

A. $75\,\text{in}^2$ B. $100\,\text{in}^2$ C. $200\,\text{in}^2$ D. $250\,\text{in}^2$



5. In the diagram, $m\angle C = 55$, $m\overset{\frown}{BD} = 70$, $\overline{DE} \cong \overline{BA}$ and the radius of the circle is 12 cm. What is the arc length of $\overset{\frown}{DE}$ to the nearest hundredth of a centimeter?

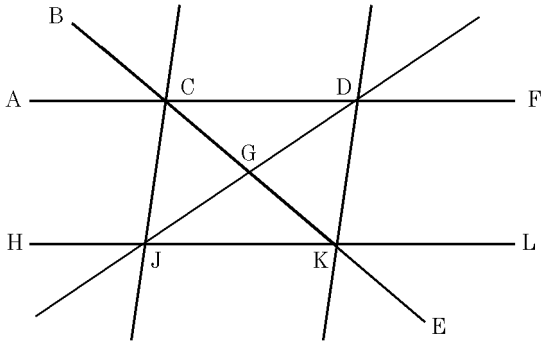
A. 11.42 cm B. 11.52 cm C. 12.64 cm D. 13.12 cm

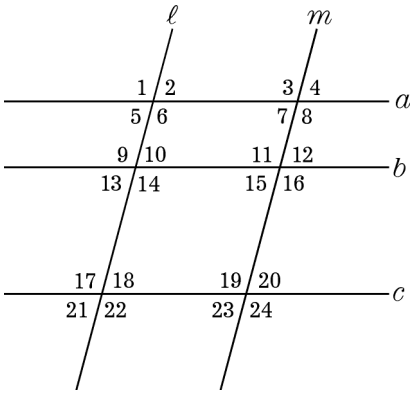


6. Which of the following statements is *not* true?

A. $m\angle DGC \cong m\angle JGK$ B. $m\angle BCA \cong m\angle DCG$

C. $m\angle CGJ \cong m\angle DGK$ D. $m\angle CJG \cong m\angle GJK$



7. 

Given the diagram above, if $m\angle 1 = m\angle 14$ and $m\angle 9 = m\angle 17$, which of the following is true?

A. line l and line m are parallel

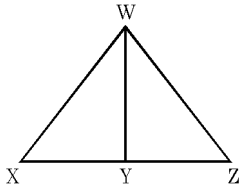
B. line l and line a are perpendicular

C. line l and line b are perpendicular

D. line a, line b, and line c are parallel

8. Given: $\overline{WY}$ is the angle bisector of $\angle XWZ$
$m\angle XYW = m\angle ZYW$

Prove: $\triangle WXY \cong \triangle WZY$



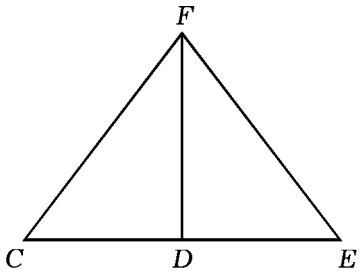
Statement	Reason
$\overline{WY}$ is the bisector of $\angle XWZ$	(1)
$m\angle XWY = m\angle ZWY$	(2)
$WY = WY$	(3)
$m\angle XYW = m\angle ZYW$	(4)
$\triangle WXY \cong \triangle WZY$	(5)

In the above proof, what is reason (5)?

A. AAS B. ASA C. SAS D. SSS

9. Given: $CF = EF$
$\overline{FD}$ is a median of $\triangle CFE$

Prove: $\overline{FD}$ bisects $\angle CFE$



statement	reason
$\overline{FD}$ is a median of $\triangle CFE$	(1)
$CD = ED$	(2)
(3)	given
(4)	(5)
$\triangle CFD \cong \triangle EFD$	(6)
(7)	(8)
$\overline{FD}$ bisects $\angle CFE$	(9)

In the above proof, what is reason (6)?

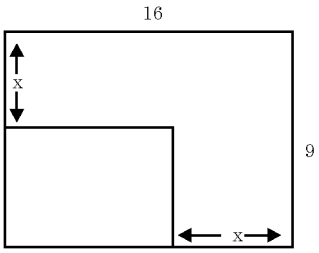
A. CPCTC B. SAS

C. SSS D. angles opposite equal sides are congruent

10. Write the equation of the circle that is tangent to the y-axis. Its center is at $(-3, 5)$.

A. $(x-3)^2 + (y+5)^2 = 9$ B. $(x+3)^2 + (y-5)^2 = 9$ C. $(x+3)^2 + (y-5)^2 = 3$ D. $(x-3)^2 + (y-5)^2 = 9$

11. Given the information in the diagram, do the rectangles have to be similar?



A. Yes. The length and width of the outer rectangle is x times the size of the inner rectangle.

B. Yes. All rectangles are similar.

C. No. $\frac{9}{16}$ does not necessarily equal x.

D. No. There is no value for x that would make the rectangles similar.

12. If two right triangles each have a 30° angle, then the triangles must be—

A. similar B. congruent C. obtuse D. equilateral

Logs and Exponents Practice Problems

Name: _____ **Date:** _____

1. Which pair of equations are inverses of each other?

   A. $f(x) = \sqrt{x+1} - 5,\ g(x) = (x+5)^2 - 1$

   B. $f(x) = \sqrt{1-x} + 5,\ g(x) = (x-5)^2 + 1$

   C. $f(x) = \sqrt{4-x} - 6,\ g(x) = -(4-x)^2 + 6$

   D. $f(x) = \sqrt{x-7} - 8,\ g(x) = -(x+8)^2 + 7$

2. Solve for the positive value of x: $25^{2x} = 5^{x^2-12}$

   A. 6 B. 4 C. 8 D. 2

3. Solve:

   $\log_5(2x+1) + \log_5 x = \log_5 10$

   A. -2.5 B. -1 C. 2 D. 5

4. What is the equation of the inverse of the logarithmic function $y = 2\log_x$?

   A. $y = x^2$ B. $y = -\sqrt{x}$

   C. $y = 2^x$ D. $y = (2x)^2$

5. If $y = \log_{10} 3$, find the value of 10^{2y}.

   A. 9 B. 10 C. 12 D. 8

6. If $\log_5 x = 4.26$, what is the value of $\log_5 \frac{25}{x^2}$?

   A. -6.52 B. 0.000000302

   C. 0.20 D. 0.23

7. Evaluate: $2\log_5 10 - \log_5 4$

   A. 1 B. 2 C. 14 D. 5

8. Which of the following is equal to $\log_9 27 + \log_3 243$?

   A. $6\frac{1}{2}$ B. 8 C. 11 D. $12\frac{1}{2}$

9. If $a = x^3y^{-2}z^{-1}$, then $\log a$ is equal to:

A. $\dfrac{3\log x}{2\log y \log z}$

B. $3\log x - 2\log y - \log z$

C. $\dfrac{1}{3}\log x - 2\log y - \log z$

D. $3\log x - \dfrac{1}{2\log y} - \dfrac{1}{\log z}$

10. Which of the following is equal to $\log_{\frac{1}{2}} 5$?

A. $-\log_2 5$

B. $\dfrac{\log 5}{\log 2}$

C. $-\dfrac{\log 2}{\log 5}$

D. $-\log\sqrt{5}$

11. $\log \dfrac{10}{x}$ is equal to:

A. $\dfrac{1}{\log x}$

B. $1 - \log x$

C. $\dfrac{1}{x}$

D. $1 - x$

12. $\log 3x^2$ is equal to:

A. $6\log x$

B. $2\log 3x$

C. $\log 3 + 2\log x$

D. $2\log 9x$

Quadratics Problems

Name: _____ **Date:** _____

1. What is the maximum number of real roots the equation $2x^6 + x^4 - 5x^2 + 1 = 0$ can have?

   A. 0 B. 3 C. 4 D. 6

2. If the roots of the quadratic equation $Ax^2 + Bx + C = 0$ are $x = 5$ and $x = -2$, then the values of A, B and C are _____.

   A. $1, 7, 10$ B. $1, -7, -10$ C. $1, -3, 10$ D. $1, -3, -10$

3. What is the extraneous root of $\sqrt{7x - 3} = 2x - 3$?

   A. -4 B. -3 C. $-\frac{3}{4}$ D. $\frac{3}{4}$

4. In order to complete the square, which of the following is needed to fill in the blank?

   $\left(x^2 + \frac{b}{a}x + \_\_\_\_\right)$

   A. $\frac{b^2}{a^2}$ B. $\frac{b^2}{4a^2}$ C. $\frac{b}{4a^2}$ D. $\frac{b}{2a}$

5. The formula $d = 16t^2$ relates time and distance for a falling object (d is the distance in feet and t is the time in seconds). Calculate the time until a ball hits the ground if dropped from a height of 400 feet.

   A. 5 seconds B. 4.2 seconds C. 4 seconds D. 3.5 seconds

6. A business can manufacture 50 unicycles a week and sell all of them for \$200 each. The owner is considering increasing the price of the unicycles, but she knows that it will decrease sales. She uses this equation to estimate how much in dollars, y, she will make if she raises the price by x dollars:

   $$y = 10000 + 50x - x^2$$

   If she wants to make \$10600, what is the least amount she can raise the price of each unicycle?

   A. \$10.00 B. \$20.00 C. \$25.00 D. \$30.00

7. The cost of a pizza with "the works" is given as a function of its diameter. The relationship is

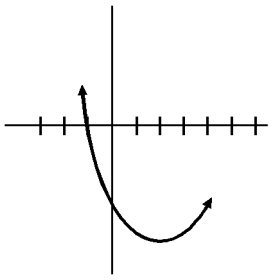
   $$C = d^2 - 2d + 447$$

   where C is the cost, in cents, and d is the diameter of the pizza, in centimeters. If the pizza costs \$16.00, then what is a reasonable estimate for the diameter of the pizza?

   A. 20 cm B. 25 cm C. 30 cm D. 35 cm

8. The graph of $y = x^2 - 4x - 5$ is a parabola. (A portion of the graph is shown.) The x-intercepts of this parabola are -1 and _____.

A. 4 B. $4\frac{1}{2}$ C. 5 D. $5\frac{1}{2}$



9. Use the given table of values to factor $f(x) = ax^2 + bx + c$.

x	$f(x)$
-2	0
0	8
4	0

A. $f(x) = -(x - 2)(x + 4)$ B. $f(x) = (x + 2)(x - 4)$ C. $f(x) = (x - 2)(x + 4)$ D. $f(x) = -(x + 2)(x - 4)$

10. Automobile headlights have a parabolic shape. If the focus of a parabolic headlight is 3.81 cm from the vertex, how far from the vertex should the bulb be placed for optimal efficiency?

A. 0 cm B. 0.3 cm C. 1.9 cm D. 3.81 cm

11. Write the equation of the parabola that opens up, has a vertex $V(2, -3)$, and is congruent to $y = x^2$. Answer in the form $y = a(x - h)^2 + k$.

A. $y = (x - 2)^2 + 3$ B. $y = (x + 2)^2 + 3$ C. $y = (x - 2)^2 - 3$ D. $y = 2x^2 - 3$

12. If the roots of the equation $x^2 + x + 1 = 0$ are expressed in the form $a + bi$, then b is equal to:

A. $\pm\frac{1}{2}$ B. $\pm\frac{3}{2}$ C. $\pm\frac{\sqrt{3}}{2}$ D. $\pm\frac{\sqrt{3}}{4}$

13. An example of an equation which has *no* real root is:

A. $3x^2 - 7x + 9 = 0$ B. $3x^2 = 7x$ C. $3x^2 + 7x - 9 = 0$ D. $3x^2 - 7x - 9 = 0$

Rationals Practice Problems

Name: _____ **Date:** _____

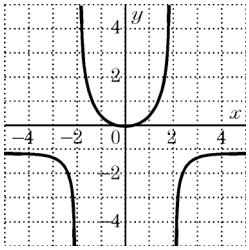
1. Simplify: $\dfrac{3x^2-6x}{4-x^2}\cdot\dfrac{3x^2+5x-2}{27x^2-3}$

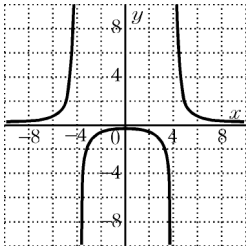
A. $\dfrac{-x}{3x+1}$ B. $\dfrac{-x(x-2)}{(3x-1)(x+2)}$ C. $\dfrac{x(x-2)}{(3x-1)(x+2)}$ D. $\dfrac{-x(x+2)}{(3x-1)(x+2)}$

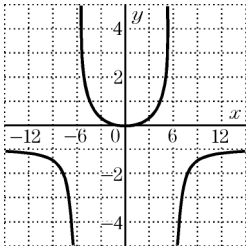
2. Simplify: $\dfrac{\left(\dfrac{7x^2y}{21x^2-6x}\right)}{\left(\dfrac{14x}{49x^2-4}\right)}$

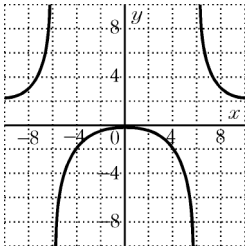
A. $\dfrac{6}{7xy+2y}$ B. $\dfrac{7xy+2xy}{6}$ C. $\dfrac{6}{7xy+2x}$ D. $\dfrac{7xy+2y}{6}$

3. Which of the following represents the graph of $y=-\dfrac{x^2}{x^2-4}$?

A. 

B. 

C. 

D. 

4. The expression $\dfrac{2+\dfrac{1}{n}}{\dfrac{1}{n^2}}$ is equivalent to:

A. $\dfrac{2n+1}{n}$ B. $\dfrac{n}{2n+1}$ C. $2n+1$ D. $n(2n+1)$

5. Simplify: $\dfrac{2x+5}{3}-\dfrac{5}{x}$

A. $\dfrac{2x^2+5x-15}{3x}$ B. $\dfrac{2}{3}$ C. $\dfrac{7x-15}{3x}$ D. $\dfrac{2x}{3-x}$

6. Add: $\dfrac{5}{2x-8}+\dfrac{3x}{x^2-16}$

A. $\dfrac{11x}{2(x-4)^2}$ B. $\dfrac{11x}{2(x+4)(x-4)}$ C. $\dfrac{11x+20}{2(x+4)(x-4)}$ D. $11x+20$

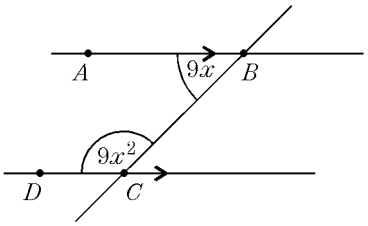
7. Combine into a single fraction: $\dfrac{2}{x-2} + \dfrac{1}{2-x}$

8. Maria can paint a room twice as fast as her daughter Rosaria. Together, they painted a room that measures 200 square feet in 17 hours. How long would it have taken Rosaria to paint the same room if she worked alone?

A. 11 hours B. 25.5 hours C. 51 hours D. 102 hours

9. A boat travels downstream at a rate of 24 km in 4 hours. Traveling upstream, the same boat travels only two-thirds of this distance in twice the time. Find the speed of the boat (in still water) and the speed of the current.

10. In the diagram, line AB is parallel to line CD. If the measure of $m\angle ABC = (9x)^\circ$ and the measure of $m\angle DCB = (9x^2)^\circ$, then what is the measure of $\angle ABC$?



11. Solve for x: $\dfrac{2}{x-2} + \dfrac{5}{x^2-4x+4} = 3$

A. $\left\{\frac{11}{3}, 1\right\}$ B. $\left\{\frac{3}{11}, -1\right\}$ C. $\left\{\frac{4}{3}, 1\right\}$ D. $\left\{\frac{8}{3}, 1\right\}$

12. Solve: $\dfrac{3x-2}{2x-3} = \dfrac{3x+5}{2x+3}$

A. $-\frac{9}{4}$ B. 1 C. $\frac{9}{4}$ D. $\pm\frac{9}{4}$

Stats Practice Problems

Name: _____ **Date:** _____

1. In a normal distribution with mean 30 and variance 25, at what percentile rank does a score of 42 fall?

   A. 0.82% B. 50.82% C. 99.55% D. 0.45%

2. If X is normally distributed with $\mu = 155$ and $\sigma = 11$, find P($145 < X < 159$).

   A. 0.3133 B. 0.5255 C. 0.4144 D. 0.4592

3. Given that X is normally distributed, $\sigma = 7$, and $P(X \geq 65) = 0.1953$, find the mean, μ, to the nearest whole number.

   A. 68 B. 60 C. 59 D. 58

4. In a normal distribution with mean 45 and variance 49, at what percentile rank does a score of 53 fall?

   A. 95.64% B. 87.29% C. 71.57% D. 12.51%

5. Three students took 3 different kinds of aptitude tests with the following results:

Ted scored 74	Christina scored 192	Steph scored 324
$\bar{x} = 61$	$\bar{x} = 170$	$\bar{x} = 285$
σ=9	σ=17	σ=26

   Who has the highest relative score?

   A. Ted B. Christina C. Steph D. Ted and Steph

6. A physical education instructor told his class that they could earn an A for the triple-jump if they could jump further than 24 feet. If the distances jumped by students are normally distributed with a mean of 22 feet and a standard deviation of 3 feet, what proportion of his students will earn an A?

   A. 0.0228 B. 0.2486 C. 0.2514 D. 0.3272

7. The number of candies in a bag is normally distributed with a mean of 200 and a standard deviation of 3. Which bag could be expected to occur less than 5% of the time?

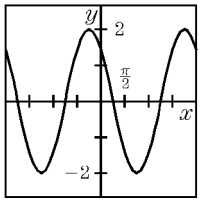
   A. a bag with 205 candies B. a bag with 204 candies

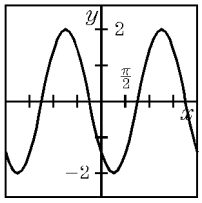
   C. a bag with 203 candies D. a bag with 198 candies

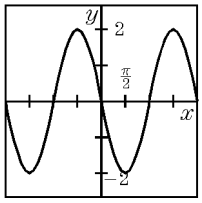
Trigonometry Practice Problems

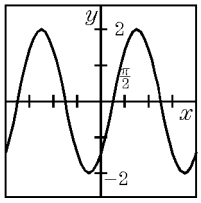
Name: _____ **Date:** _____

1. Which of the graphs shown is the graph of $y = -2\cos\left(x - \frac{\pi}{2}\right)$?

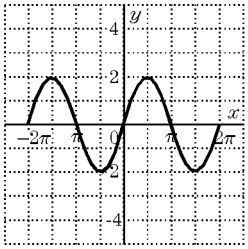
A. 

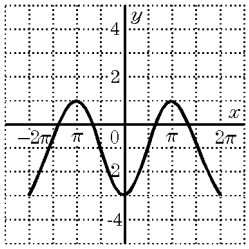
B. 

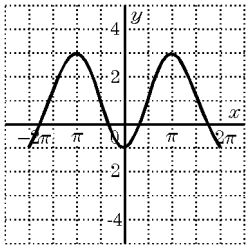
C. 

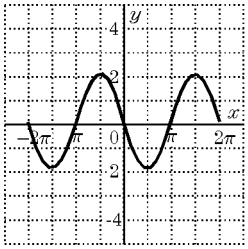
D. 

2. The graph of the function $y = -2\cos x + 1$ where $-2\pi \le x \le 2\pi$ is best pictured as:

A. 

B. 

C. 

D. 

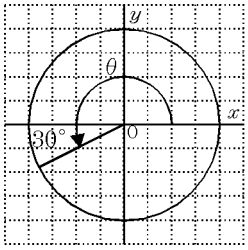
3. The maximum value of $3\cos 2x$ is:

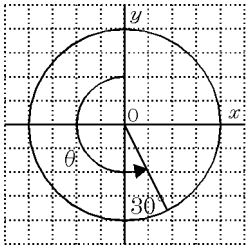
A. 1 B. 2π C. 3 D. 6

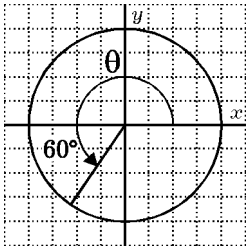
4. Express in degrees an angle of $\frac{2\pi}{15}$ radians.

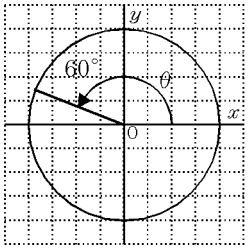
A. 24° B. 12° C. 18° D. 30°

5. Which graph shows the angle $\theta = 240^\circ$ in standard position?

A. 

B. 

C. 

D. 

6. Which of the following are coterminal with 40°?

-40°, 140°, -320°, 300°, 400°, 760°

7. What is the period of the graph which represents the function $y = 3\cos\frac{1}{2}x$?

A. π B. 2π C. $\frac{\pi}{2}$ D. 4π

8. Find the phase shift and period for the function $y = 2\sin 3\left(x - \frac{\pi}{2}\right) + 1$.

A. phase shift: $\frac{\pi}{2}$; period: $\frac{2\pi}{3}$

B. phase shift: $-\frac{\pi}{2}$; period: $\frac{2\pi}{3}$

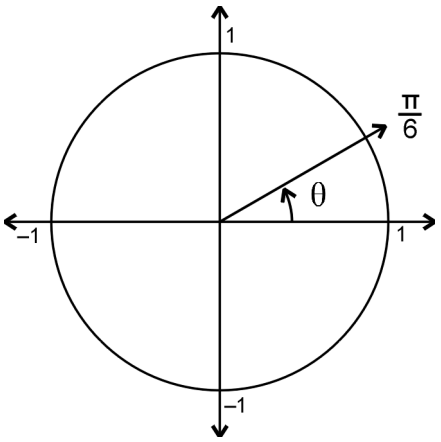
C. phase shift: $-\frac{\pi}{2}$; period: $-\frac{2\pi}{3}$

D. phase shift: $\frac{\pi}{3}$; period: 3

9. Simplify: $\dfrac{\sqrt{\sec^2 x - 1}}{\sqrt{\csc^2 x - 1}}$

A. $\sin^2 x$ B. $\tan^2 x$ C. $\tan^4 x$ D. $\cot^4 x$

10. In the diagram of the unit circle, what is $\cos\theta$?



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

11. Find the numerical value of $\tan\frac{\pi}{3}$.

12. Determine the period of the function:

$y = \frac{1}{2}\sin\left(\frac{x}{3} - \pi\right)$

A. $\frac{2\pi}{3}$ B. π C. 6π D. 9π