

Student: \_\_\_\_\_  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

Instructor: Tom Blackburn  
Program: NEIU MATHEMATICS  
PLACEMENT TESTS  
Test Bank: MyMathTest: Developmental  
Mathematics

Assignment: NEIU MPT PRACTICE  
TEST: Pre-Calculus

1. For the functions  $f$  and  $g$  find **a.**  $(f + g)(x)$ , **b.**  $(f - g)(x)$ , **c.**  $(f \cdot g)(x)$ , and **d.**  $\left(\frac{f}{g}\right)(x)$ .

$$f(x) = x - 8, \quad g(x) = 5x + 9$$

**a.**  $(f + g)(x) = \square$

**b.**  $(f - g)(x) = \square$

**c.**  $(f \cdot g)(x) = \square$

**d.**  $\left(\frac{f}{g}\right)(x) = \square$

2. Use the Pythagorean identity  $\sin^2 \theta + \cos^2 \theta = 1$  to find  $\cos \theta$ . The angle  $\theta$  is an acute angle.

$$\sin \theta = \frac{\sqrt{2}}{7}$$

$\cos \theta = \square$

(Simplify your answer. Type an exact answer, using radicals as needed. Use integers or fractions for any numbers in the expression. Rationalize all denominators.)

3.  $\theta$  is an acute angle and  $\sin \theta$  and  $\cos \theta$  are given. Use identities to find the indicated value.

$$\sin \theta = -\frac{5}{7}, \quad \cos \theta = \frac{-2\sqrt{6}}{7}. \quad \text{Find } \tan \theta.$$

☐ A.  $\frac{-7\sqrt{6}}{12}$

☐ B.  $\frac{5\sqrt{6}}{5}$

☐ C.  $-\frac{7}{5}$

☐ D.  $\frac{5\sqrt{6}}{12}$

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4. Find the radian measure of the central angle of a circle of radius  $r = 40$  inches that intercepts an arc of length  $s = 130$  inches.

The radian measure of the central angle is .

(Type an integer or a simplified fraction.)

5. Write the difference as a single logarithm. Assume that variables represent positive numbers.

$$\log_5(x^2 + 7) - \log_5(x^2 + 6)$$

$$\log_5(x^2 + 7) - \log_5(x^2 + 6) = \text{}$$

(Simplify your answer.)

6. Use the power property to rewrite the expression.

$$\log_4 3^{-5}$$

$$\log_4 3^{-5} = \text{}$$

7. Write as an exponential equation.

$$\log_{0.7} 0.343 = 3$$

The logarithm  $\log_{0.7} 0.343 = 3$  written as an exponential equation is .

(Use integers or decimals for any numbers in the equation. Type an equation. Type your answer using exponential notation.)

8. Solve for  $x$ .

$$\log_4 \frac{1}{64} = x$$

☐ A.  $\frac{1}{256}$

☐ B.  $\frac{1}{16}$

☐ C. 3

☐ D. -3

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9. Solve for x.

$$1000^x = 10000$$

The solution is  $x = \square$ .  
(Simplify your answer.)

10. For the functions f and g find **a.**  $(f + g)(x)$ , **b.**  $(f - g)(x)$ , **c.**  $(f \cdot g)(x)$ , and **d.**  $\left(\frac{f}{g}\right)(x)$ .

$$f(x) = x - 6, \quad g(x) = 8x + 9$$

**a.**  $(f + g)(x) = \square$

**b.**  $(f - g)(x) = \square$

**c.**  $(f \cdot g)(x) = \square$

**d.**  $\left(\frac{f}{g}\right)(x) = \square$

11.  $\theta$  is an acute angle and  $\sin \theta$  and  $\cos \theta$  are given. Use identities to find  $\tan \theta$ ,  $\csc \theta$ ,  $\sec \theta$ , and  $\cot \theta$ . Where necessary, rationalize denominators.

$$\sin \theta = \frac{20}{29}, \quad \cos \theta = \frac{21}{29}$$

$\tan \theta = \square$  (Type an integer or a simplified fraction.)

$\csc \theta = \square$  (Type an integer or a simplified fraction.)

$\sec \theta = \square$  (Type an integer or a simplified fraction.)

$\cot \theta = \square$  (Type an integer or a simplified fraction.)

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12. Find the length of the arc,  $s$ , on a circle of radius  $r$  intercepted by a central angle  $\theta$ . Express arc length in terms of  $\pi$ . Then round your answer to two decimal places.

Radius,  $r = 17$  feet; Central angle,  $\theta = 255^\circ$

$s = \square$  feet

(Simplify your answer. Type your answer in terms of  $\pi$ . Use integers or fractions for any numbers in the expression.)

$s = \square$  feet

(Type your answer rounded to two decimal places.)

13. Find the amplitude, period, and phase shift of the function. Graph the function. Show at least one period.

$$y = 6 \sin(4\pi x + 2)$$

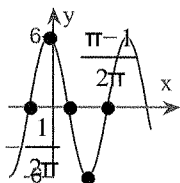
Type the amplitude, period, and phase shift of the function.

Amplitude =  $\square$  Period =  $\square$  Phase shift =  $\square$

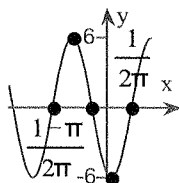
(Simplify your answer. Type an exact answer, using  $\pi$  as needed. Use integers or fractions for any numbers in the expression.)

Choose the correct graph of the function  $y = 6 \sin(4\pi x + 2)$ .

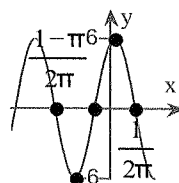
☐ A.



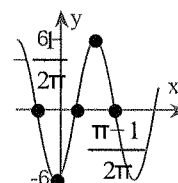
☐ B.



☐ C.



☐ D.



14. Write as an exponential equation.

$$\log_2 32 = 5$$

The logarithmic equation  $\log_2 32 = 5$  written as an exponential equation is  $\square$ .

(Type an equation. Type your answer using exponential notation.)

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15. Find  $(f \circ g)(x)$  and  $(g \circ f)(x)$ .

$$f(x) = -2x^2 + 2, \quad g(x) = -2x$$

$$(f \circ g)(x) = \boxed{\phantom{000}} \text{ (Simplify your answer.)}$$

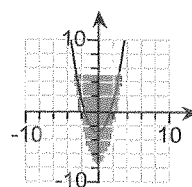
$$(g \circ f)(x) = \boxed{\phantom{000}} \text{ (Simplify your answer.)}$$

16. Graph the inequality.

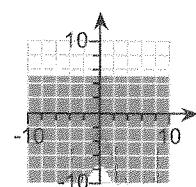
$$y + 3 \geq x^2$$

Which graph displays the solution to the inequality?

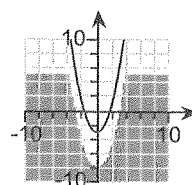
☐ A.



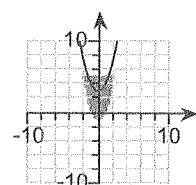
☐ B.



☐ C.



☐ D.



17. Find the inverse of the one-to-one function.

$$f(x) = \frac{x + 5}{7}$$

$$f^{-1}(x) = \boxed{\phantom{000}}$$

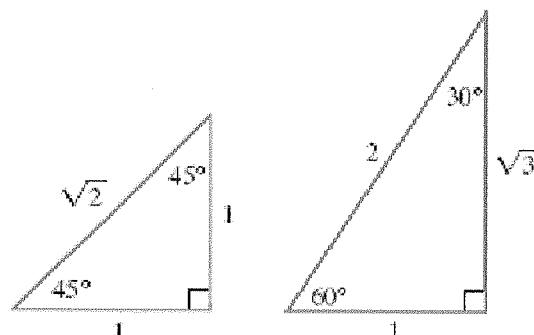
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18. Use the given triangles to evaluate the following expression. If necessary, express the value without a square root in the denominator by rationalizing the denominator.

$$\cot\left(\frac{\pi}{3}\right)$$



$$\cot\left(\frac{\pi}{3}\right) = \square$$

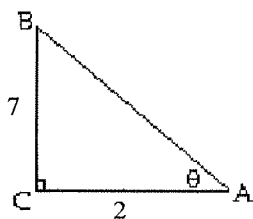
(Simplify your answer. Type an exact answer, using radicals as needed. Use integers or fractions for any numbers in the expression. Rationalize all denominators.)

19. A water wheel has a radius of 15 feet. The wheel is rotating at 20 revolutions per minute. Find the linear speed, in feet per minute, of the water.

The linear speed is  $\square$  feet per minute.

(Simplify your answer. Type your answer in terms of  $\pi$ .)

20. Two sides of a right triangle ABC (C is the right angle) are given. Find the indicated trigonometric function of the given angle. Give an exact answer with a rational denominator.



- ☐ A.  $\sin \theta = \frac{7\sqrt{53}}{53}$   
☐ B.  $\sin \theta = \frac{\sqrt{53}}{2}$   
☐ C.  $\sin \theta = \frac{\sqrt{53}}{7}$   
☐ D.  $\sin \theta = \frac{2\sqrt{53}}{53}$

Find  $\sin \theta$ .

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21. Sketch the graph of the equation. If the graph is a parabola, find its vertex. If the graph is a circle, find its center and radius.

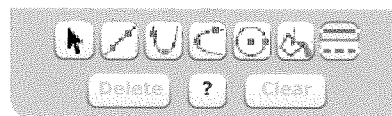
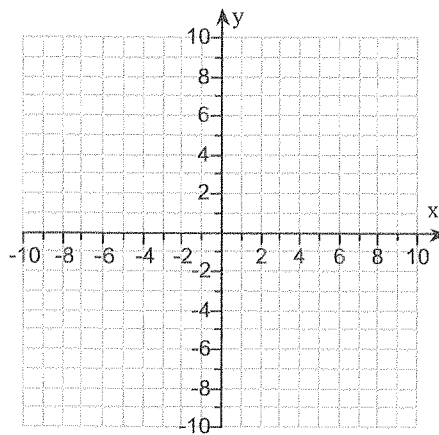
$$(x - 1)^2 + (y - 3)^2 = 25$$

Use the graphing tool to graph the equation.



Select the correct choice below and, if necessary, fill in the answer box(es) to complete your choice.

- ☐ A. The graph is a parabola with the vertex located at .  
(Type an ordered pair.)
- ☐ B. The graph is a circle with radius .  
The center is located at .  
(Type an ordered pair.)



22. The point given below is on the terminal side of an angle  $\theta$ . Find the exact value of each of the six trigonometric functions of  $\theta$ .

$$(24, -7)$$

$$\sin \theta = \boxed{\phantom{000}} \text{ (Type an integer or a simplified fraction.)}$$

$$\cos \theta = \boxed{\phantom{000}} \text{ (Type an integer or a simplified fraction.)}$$

$$\tan \theta = \boxed{\phantom{000}} \text{ (Type an integer or a simplified fraction.)}$$

$$\cot \theta = \boxed{\phantom{000}} \text{ (Type an integer or a simplified fraction.)}$$

$$\sec \theta = \boxed{\phantom{000}} \text{ (Type an integer or a simplified fraction.)}$$

$$\csc \theta = \boxed{\phantom{000}} \text{ (Type an integer or a simplified fraction.)}$$

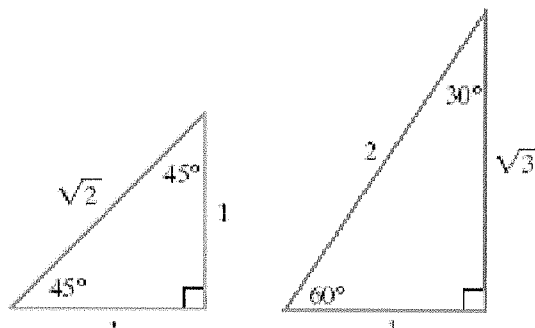
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23. Use the given triangles to evaluate the following expression. If necessary, express the value without a square root in the denominator by rationalizing the denominator.

$$\sin 45^\circ$$



$$\sin 45^\circ = \square$$

(Simplify your answer. Type an exact answer, using radicals as needed. Use integers or fractions for any numbers in the expression. Rationalize all denominators.)

24. Find the vertex of the graph of the following quadratic function.

$$f(x) = x^2 + 10x + 9$$

The vertex is  $\square$ .

(Type an ordered pair.)

25. If  $f(x) = x^2 - 6x + 2$  and  $g(x) = -2x$ , find the following composition.

$$(g \circ f)(3)$$

$$(g \circ f)(3) = \square$$

26. Determine whether the function is a one-to-one function.

$$f = (6, -8), (-12, -8), (-5, -5)$$

- ☐ one-to-one  
☐ not one-to-one



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27. Determine whether  $y$  is a function of  $x$ .

$$x = y^2 + 2$$

- ☐ A. Yes  
☐ B. No

28. Given the function  $f(x) = |x + 2|$ , find each of the following.

$$f(1), f(-6), f(0)$$

$$f(1) = \square$$

(Simplify your answer. Type an integer or a fraction.)

$$f(-6) = \square$$

(Simplify your answer. Type an integer or a fraction.)

$$f(0) = \square$$

(Simplify your answer. Type an integer or a fraction.)

29. Write as a single logarithm. Assume that variables represent positive numbers.

$$\log_9 5 + 2 \log_9 7$$

$$\log_9 5 + 2 \log_9 7 = \square$$

30. Solve.

$$\log_3 27 = x$$

$$x = \square.$$

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1. 
$$\frac{(6x + 1)(-4x - 17)(5x^2 - 31x - 72)(x - 8)}{5x + 9}$$

2. 
$$\frac{\sqrt{47}}{7}$$

3. D

4. 
$$\frac{13}{4}$$

5. 
$$\log_5 \frac{x^2 + 7}{x^2 + 6}$$

6.  $-5 \log_4 3$

7.  $0.7^3 = 0.343$

8. D

9. 
$$\frac{4}{3}$$

10. 
$$\frac{(9x + 3)(-7x - 15)(8x^2 - 39x - 54)(x - 6)}{8x + 9}$$

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$$\begin{array}{r} 11. \quad \frac{20}{21} \\ \frac{29}{20} \\ \frac{29}{21} \\ \frac{21}{21} \\ \frac{20}{20} \end{array}$$

$$12. \quad \frac{289\pi}{12} \\ 75.66$$

$$13. \quad \frac{6}{2} \\ - \frac{1}{2\pi} \\ A$$

$$14. \quad 2^5 = 32$$

$$15. \quad -8x^2 + 2 \\ 4x^2 - 4$$

$$16. \quad A$$

$$17. \quad 7x - 5$$

$$18. \quad \frac{\sqrt{3}}{3}$$

$$19. \quad 600\pi$$

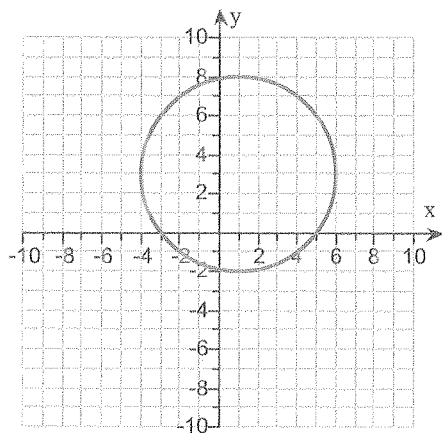
$$20. \quad A$$

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21.



B, 5, (1,3)

22.

$$\begin{array}{r} -\frac{7}{25} \\ \frac{24}{25} \\ -\frac{7}{24} \\ \frac{24}{7} \\ \frac{25}{24} \\ -\frac{25}{7} \end{array}$$

23.

$$\frac{\sqrt{2}}{2}$$

24.

(-5, -16)

25.

14

26.

the second choice

27.

B

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28.        3  
            4  
            2

29.         $\log_9 245$

30.        3