ALGEBRA 2 WITH TRIG SECOND SEMESTER REVIEW

Multiple Choice
Identify the choice that best completes the statement or answers the question.

What is the solution of the equation?

1. \( \sqrt{x} + 10 - 7 = -5 \)
   a. 14  b. -8  c. 4  d. -6

2. \(-10 + \sqrt{x} + 8 = -4\)
   a. 36  b. 28  c. -2  d. 44

3. Let \( f(x) = -5x - 4 \) and \( g(x) = 6x - 7 \). Find \( f(x) + g(x) \).
   a. \(-11x + 3\)  b. \(x + 3\)  c. \(-11x - 11\)  d. \(x - 11\)

4. Let \( f(x) = 3x + 2 \) and \( g(x) = 7x + 6 \). Find \( f \cdot g \) and its domain.
   a. \(6x^2 + 4x + 42\); all real numbers except \( x = -\frac{2}{3}\)
   b. \(6x^2 + 4x + 42\); all real numbers
   c. \(21x^2 + 32x + 12\); all real numbers
   d. \(21x^2 + 32x + 12\); all real numbers except \( x = -\frac{6}{7}\)

5. Let \( f(x) = x^2 - 16 \) and \( g(x) = x + 4 \). Find \( \frac{f}{g} \) and its domain.
   a. \(x + 4\); all real numbers except \( x \neq 4\)
   b. \(x + 4\); all real numbers except \( x \neq -4\)
   c. \(x - 4\); all real numbers except \( x \neq 4\)
   d. \(x - 4\); all real numbers except \( x \neq -4\)

6. Let \( f(x) = x + 2 \) and \( g(x) = x^2 \). Find \( (g \circ f)(-5) \).
   a. 9  b. -3  c. 49  d. -10

7. Is relation \( t \) a function? Is the inverse of relations \( t \) a function?
   Relation \( t \)
   \[
   \begin{array}{c|cccc}
   x & 0 & 2 & 4 & 6 \\
   \hline
   y & -8 & -7 & -4 & -4 \\
   \end{array}
   \]
   a. Relation \( t \) is not a function. The inverse of relation \( t \) is a function.
   b. Relation \( t \) is not a function. The inverse of relation \( t \) is not a function.
   c. Relation \( t \) is not a function. The inverse of relation \( t \) is a function.
   d. Relation \( t \) is a function. The inverse of relation \( t \) is not a function.

What is the inverse of the given relation?

8. \( y = 3x + 9 \)
a. \( y = \frac{1}{3} x + 3 \)
b. \( y = 3x - 3 \)
c. \( y = 3x + 3 \)
d. \( y = \frac{1}{3} x - 3 \)

Graph the equation.

9. \( y = \sqrt{x} - 3 \)
a. 

9. \( y = \sqrt{x} - 3 \)
b. 

c. 

d. 

10. \( y = 3\sqrt{x} - 1 + 1 \)
Graph the exponential function.

11. \( y = 4(3)^x \)

a. 

![Graph of exponential function]

c. 

![Graph of exponential function]
Graph the function.

12. \( y = -2 \left( \frac{1}{8} \right)^x \)

13. Use the graph of \( y = e^x \) to evaluate \( e^{17} \) to four decimal places.
a. 5.4739  
   b. 4.6211  
   c. 2.7183  
   d. 0.1827

14. How much money invested at 5% compounded continuously for 3 years will yield $820?
   a. $952.70  
   b. $818.84  
   c. $780.01  
   d. $705.78

Write the equation in exponential form.

15. \( \log_{4}\frac{1}{16} = -2 \)
   a. \( \frac{1}{4^2} = 16 \)  
   b. \( 4^2 = 16 \)  
   c. \( 16^{\frac{1}{2}} = 4 \)  
   d. \( 4^{-2} = \frac{1}{16} \)

Evaluate the logarithm.

16. \( \log_3 243 \)
   a. 5  
   b. -5  
   c. 4  
   d. 3

Graph the logarithmic equation.

17. \( y = \log_5 x \)
   a. 
   c. 

Write the expression as a single logarithm.

18. \( \log_7 50 - \log_7 5 \)
   a. \( \log_7 45 \)  
   b. \( \log_7^{\frac{45}{5}} \)  
   c. \( \log_7 10 \)  
   d. \( \log_7 10 \)

Expand the logarithmic expression.

19. \( \log_3 \frac{d}{12} \)
   a. \( \log_3 d - \log_3 12 \)  
   b. \( -d \log_3 12 \)  
   c. \( \frac{\log_3 d}{\log_3 12} \)  
   d. \( \log_3 12 - \log_3 d \)

Solve the logarithmic equation. Round to the nearest ten-thousandth if necessary.

20. \( \log(x + 9) - \log x = 3 \)
   a. 0.0090  
   b. 0.3103  
   c. 3.2222  
   d. 111

Graph the function.

21. \( y = \frac{4}{x} \)
Sketch the asymptotes and graph the function.

22. \( y = \frac{5}{x - 1} - 1 \)
23. Write an equation for the translation of $y = \frac{4}{x}$ that has the asymptotes $x = 7$ and $y = 6$.
   a. $y = \frac{4}{x - 6} + 7$
   b. $y = \frac{4}{x + 7} + 6$
   c. $y = \frac{4}{x - 7} + 6$
   d. $y = \frac{4}{x + 6} + 7$

24. This graph of a function is a translation of $y = \frac{4}{x}$. What is an equation for the function?
   a. $y = \frac{4}{x + 3} + 4$
   b. $y = \frac{4}{x + 3} - 4$
   c. $y = \frac{4}{x + 4} - 3$
   d. $y = \frac{4}{x + 4} + 3$

Find any points of discontinuity for the rational function.

25. What are the points of discontinuity? Are they all removable?
26. \( y = \frac{(x - 7)(x - 3)}{x^2 - 10x + 21} \)
   a. \( x = 1, x = -8, x = -2; \) yes
   b. \( x = 7, x = 3; \) yes
   c. \( x = -7, x = -3; \) no
   d. \( x = -1, x = 8, x = 2; \) no

\[
27. \text{Describe the vertical asymptote(s) and hole(s) for the graph of } y = \frac{x - 1}{x^2 + 6x + 8}.
\]
   a. asymptotes: \( x = -4, -2 \) and hole: \( x = 1 \)
   b. asymptote: \( x = 1 \) and no holes
   c. asymptote: \( x = 1 \) and holes: \( x = -4, -2 \)
   d. asymptotes: \( x = -4, -2 \) and no holes

What is the graph of the rational function?

\[
28. \ y = \frac{(x - 1)(x + 3)}{(x + 3)(x - 3)}
\]
   a.  
   b.  
   c.  
   d.  
What is the product in simplest form? State any restrictions on the variable.

29. \( \frac{y^2}{y - 3} \cdot \frac{y^2 - y - 6}{y^2 + 1y} \)
   a. \( \frac{y^2 + 2y}{y + 1} \), \( y \neq 3, -1 \)
   b. \( \frac{y^2 + 2y}{y + 1} \), \( y \neq 3, 0, -1 \)
   c. \( \frac{y + 2}{y + 1} \), \( y \neq 3, 0, -1 \)
   d. \( \frac{y + 2}{y + 1} \), \( y \neq 3, -1 \)

Simplify the sum.

30. \( \frac{\alpha^2 + 7\alpha + 10}{\alpha^2 + 2\alpha - 15} + \frac{10}{\alpha - 3} \)
   a. \( \frac{\alpha + 12}{\alpha - 3} \)
   b. \( \frac{\alpha + 2}{\alpha - 3} \)
   c. \( \frac{\alpha^2 + 7\alpha + 20}{\alpha^2 + 2\alpha - 15} \)
   d. \( \alpha + 12 \)

Simplify the complex fraction.

31. \( \frac{y - 1}{y^2 + y - 6} \)
   a. \( \frac{(y - 1)(y - 6)}{(y + 3)^2(y - 2)} \)
   b. \( \frac{y - 1}{(y - 6)(y - 2)} \)
   c. \( \frac{(y - 1)(y - 6)}{(y + 3)(y - 2)} \)
   d. \( \frac{(y - 1)(y - 2)}{(y - 6)(y + 2)} \)

Solve the equation. Check the solution.

32. \( \frac{6}{x^2 - 9} - \frac{1}{x - 3} = 1 \)
   a. \(-4\)
   b. \(2\)
   c. \(-1 \pm \sqrt{73} \frac{2}{2} \)
   d. \(3 \text{ or } -4\)

What is an equation of a parabola with the given vertex and focus?

33. vertex: \((5, 4)\); focus: \((8, 4)\)
   a. \( x = \frac{1}{12} (y - 4)^2 + 5 \)
   b. \( y = \frac{1}{12} (x + 4)^2 - 5 \)
   c. \( x = \frac{1}{12} (y + 4)^2 - 5 \)
   d. \( y = \frac{1}{12} (x - 4)^2 + 5 \)
Write an equation of a circle with the given center and radius.

34. center (2, −4) and radius 5
   a. \((x - 2)^2 + (y + 4)^2 = 5\)  
   b. \((x + 2)^2 + (y - 4)^2 = 5\)  
   c. \((x + 2)^2 + (y - 4)^2 = 25\)  
   d. \((x - 2)^2 + (y + 4)^2 = 25\)

Write an equation of an ellipse in standard form with the center at the origin and with the given characteristics.

35. vertex at (−3, 0) and co-vertex at (0, 2)
   a. \(\frac{x^2}{9} + \frac{y^2}{4} = 1\)  
   b. \(\frac{x^2}{4} + \frac{y^2}{9} = 1\)  
   c. \(\frac{x^2}{3} + \frac{y^2}{2} = 1\)  
   d. \(\frac{x^2}{2} + \frac{y^2}{3} = 1\)

What is the standard-form equation of the ellipse shown?

36. 
   ![Diagram of an ellipse]
   a. \(\frac{x^2}{6} + \frac{y^2}{5} = 1\)  
   b. \(\frac{x^2}{25} - \frac{y^2}{36} = 1\)  
   c. \(\frac{x^2}{6} - \frac{y^2}{5} = 1\)  
   d. \(\frac{x^2}{36} + \frac{y^2}{25} = 1\)

37. A yogurt shop offers 6 different flavors of frozen yogurt and 12 different toppings. How many choices are possible for a single serving of frozen yogurt with one topping?
   a. 144  
   b. 72  
   c. 36  
   d. 665,280

38. Evaluate \(\binom{9}{4}\).
   a. 9  
   b. 362,880  
   c. 126  
   d. 3,024

39. A bag contains 6 red marbles, 6 white marbles, and 4 blue marbles. Find \(P(\text{red or blue})\).
   a. \(\frac{2}{3}\)  
   b. \(\frac{3}{2}\)  
   c. \(\frac{5}{8}\)  
   d. \(\frac{3}{4}\)
40. A bag contains 5 red marbles, 6 white marbles, and 5 blue marbles. Find \( P(\text{red and blue}) \).

\[ \text{a. } \frac{25}{16} \quad \text{b. } \frac{11}{16} \quad \text{c. } 0 \quad \text{d. } \frac{2}{3} \]

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

41. Test scores on a math exam:
88, 89, 65, 62, 83, 63, 84, 63, 74, 64, 71, 82, 66, 88, 79, 60, 86, 63, 93, 99, 60, 85

\[ \text{a. mean = 75.8, median = 79.5, mode = 63} \]
\[ \text{b. mean = 75.8, median = 76.5, mode = 63} \]
\[ \text{c. mean = 69.5, median = 76.5, mode = 63} \]
\[ \text{d. mean = 69.5, median = 76.5, mode = 79.5} \]

Find the outlier in the set of data.

42. 3.4, 4.8, 3.1, 0.2, 6.9, 5.5, 6.6, 5.1

\[ \text{a. 3.1} \quad \text{b. 0.2} \quad \text{c. 5.1} \quad \text{d. 5.1} \]

Make a box-and-whisker plot of the data.

43. 24, 18, 29, 21, 16, 23, 13, 11

\[ \text{a.} \]
\[ \text{b.} \]
\[ \text{c.} \]
\[ \text{d.} \]

Use a calculator to find the mean and standard deviation of the data. Round to the nearest tenth.

44. 20, 16, 18, 14, 9, 20, 16

\[ \text{a. mean = 16; standard deviation = 3.6} \]
\[ \text{b. mean = 16.1; standard deviation = 3.6} \]
\[ \text{c. mean = 16; standard deviation = 12.7} \]
\[ \text{d. mean = 16.1; standard deviation = 12.7} \]

45. Researchers randomly choose two groups from 15 volunteers. Over a period of 9 weeks, one group watches television before going to sleep, and the other does not. Volunteers wear monitoring devices while sleeping, and researchers record dream activity. Which type of study method is described in each situation?

\[ \text{a. controlled experiment} \quad \text{b. observational study} \quad \text{c. survey} \]
Sketch the angle in standard position.

46. 35°
   a. 
   b. 
   c. 
   d. 

47. Find the measure of an angle between 0° and 360° coterminal with an angle of –271° in standard position.
   a. 91°
   b. 271°
   c. 89°
   d. 181°

48. Find the exact value of cos 300°.
   a. \( \cos = \frac{1}{2} \)
   b. \( \cos = \frac{1}{2} \)
   c. \( \cos = \frac{\sqrt{3}}{2} \)
   d. \( \cos = \frac{\sqrt{3}}{2} \)

49. Find the exact value of \( \cos \left( \frac{7\pi}{4} \text{ radians} \right) \)
   a. \( \frac{\sqrt{2}}{2} \)
   b. \( \frac{1}{2} \)
   c. \( \frac{\sqrt{3}}{2} \)
   d. \( -\frac{1}{2} \)

50. Find the amplitude of the sine curve shown below.
Sketch one cycle of the cosine function.

51. \( y = 3 \cos \theta \)

What is the value of the expression? Do not use a calculator.
52. \( \tan \frac{\pi}{6} \)
   a. -1  
   b. \( \sqrt{3} \)  
   c. \( \frac{\sqrt{3}}{3} \)  
   d. -\( \sqrt{3} \)

Write an equation for the translation of the function.

53. \( y = \cos x \); translated 6 units up
   a. \( y = \cos (x + 6) \)  
   b. \( y = \cos (x - 6) \)  
   c. \( y = \cos x - 6 \)  
   d. \( y = \cos x + 6 \)

Find the exact value. If the expression is undefined, write undefined.

54. \( \csc 135^\circ \)
   a. 0  
   b. undefined  
   c. \( \frac{1}{2} \)  
   d. \( \sqrt{2} \)

Simplify the trigonometric expression.

55. \( \frac{\sin^2 \theta}{1 - \cos \theta} \)
   a. \( 1 + \cos \theta \)  
   b. \( \sin \theta \)  
   c. \( \frac{1 - \sin \theta}{\cos \theta} \)  
   d. \( \frac{1 + \sin \theta}{\cos \theta} \)

Use the unit circle to find the inverse function value in degrees.

56. \( \cos^{-1} \left( \frac{\sqrt{3}}{2} \right) \)
   a. 60°  
   b. 30°  
   c. 240°  
   d. 150°

For a standard-position angle determined by the point \((x, y)\), what are the values of the trigonometric functions?

57. For the point (4, 3), find \( \tan \theta \) and \( \cot \theta \).
   a. \( \tan \theta = \frac{3}{4} \)  
   b. \( \tan \theta = \frac{5}{4} \)  
   c. \( \tan \theta = \frac{4}{5} \)  
   d. \( \tan \theta = \frac{4}{3} \)  
   cot \( \theta = \frac{3}{4} \)  
   cot \( \theta = \frac{3}{5} \)  
   cot \( \theta = \frac{4}{5} \)
Find the height of the triangle.

58. \[ \frac{10}{x} = \frac{\sin 20^\circ}{\sin \theta} \]

a. 3.4  b. 9.4  c. 3.6  d. 6.6

Use the Law of Sines to find the missing angle of the triangle.

59. Find \( \angle C \) to the nearest tenth.

\[ \frac{24}{\sin 39^\circ} = \frac{24}{\sin \angle C} \]

a. 156.6°  b. 94.8°  c. 23.4°  d. 85.2°

Use the Law of Cosines to find the missing angle.

60. Find \( \angle A \) to the nearest tenth of a degree.
\begin{itemize}
\item a. $33.9^\circ$
\item b. $57.7^\circ$
\item c. $46.3^\circ$
\item d. $85.7^\circ$
\end{itemize}
ALGEBRA 2 WITH TRIG SECOND SEMESTER REVIEW
Answer Section

MULTIPLE CHOICE

1. ANS: D  REF: 6-5 Solving Square Root and Other Radical Equations
2. ANS: B  REF: 6-5 Solving Square Root and Other Radical Equations
3. ANS: D  REF: 6-6 Function Operations
4. ANS: C  REF: 6-6 Function Operations
5. ANS: D  REF: 6-6 Function Operations
6. ANS: A  REF: 6-6 Function Operations
7. ANS: D  REF: 6-7 Inverse Relations and Functions
8. ANS: D  REF: 6-7 Inverse Relations and Functions
9. ANS: C  REF: 6-8 Graphing Radical Functions
10. ANS: B  REF: 6-8 Graphing Radical Functions
11. ANS: B  REF: 7-1 Exploring Exponential Models
12. ANS: A  REF: 7-2 Properties of Exponential Functions
13. ANS: A  REF: 7-2 Properties of Exponential Functions
14. ANS: D  REF: 7-2 Properties of Exponential Functions
15. ANS: D  REF: 7-3 Logarithmic Functions as Inverses
16. ANS: A  REF: 7-3 Logarithmic Functions as Inverses
17. ANS: A  REF: 7-3 Logarithmic Functions as Inverses
18. ANS: C  REF: 7-4 Properties of Logarithms
19. ANS: A  REF: 7-4 Properties of Logarithms
20. ANS: A  REF: 7-5 Exponential and Logarithmic Equations
21. ANS: C  REF: 8-2 The Reciprocal Function Family
22. ANS: C  REF: 8-2 The Reciprocal Function Family
23. ANS: C  REF: 8-2 The Reciprocal Function Family
24. ANS: D  REF: 8-2 The Reciprocal Function Family
25. ANS: B  REF: 8-3 Rational Functions and Their Graphs
26. ANS: B  REF: 8-3 Rational Functions and Their Graphs
27. ANS: D  REF: 8-3 Rational Functions and Their Graphs
28. ANS: B  REF: 8-3 Rational Functions and Their Graphs
29. ANS: B  REF: 8-4 Rational Expressions
30. ANS: A  REF: 8-5 Adding and Subtracting Rational Expressions
31. ANS: B  REF: 8-5 Adding and Subtracting Rational Expressions
32. ANS: A  REF: 8-6 Solving Rational Equations
33. ANS: A  REF: 10-2 Parabolas
34. ANS: D  REF: 10-3 Circles
35. ANS: A  REF: 10-4 Ellipses
36. ANS: D  REF: 10-4 Ellipses
37. ANS: B  REF: 11-1 Permutations and Combinations
38. ANS: D  REF: 11-1 Permutations and Combinations
39. ANS: C  REF: 11-2 Probability
40. ANS: C  REF: 11-2 Probability
41. ANS: B  REF: 11-6 Analyzing Data
42. ANS: B REF: 11-6 Analyzing Data
43. ANS: A REF: 11-6 Analyzing Data
44. ANS: B REF: 11-7 Standard Deviation
45. ANS: A REF: 11-8 Samples and Surveys
46. ANS: C REF: 13-2 Angles and the Unit Circle
47. ANS: C REF: 13-2 Angles and the Unit Circle
48. ANS: B REF: 13-2 Angles and the Unit Circle
49. ANS: A REF: 13-3 Radian Measure
50. ANS: B REF: 13-4 The Sine Function
51. ANS: B REF: 13-5 The Cosine Function
52. ANS: C REF: 13-6 The Tangent Function
53. ANS: D REF: 13-7 Translating Sine and Cosine Functions
54. ANS: D REF: 13-8 Reciprocal Trigonometric Functions
55. ANS: A REF: 14-1 Trigonometric Identities
56. ANS: B REF: 14-2 Solving Trigonometric Equations Using Inverses
57. ANS: A REF: 14-3 Right Triangles and Trigonometric Ratios
58. ANS: A REF: 14-3 Right Triangles and Trigonometric Ratios
59. ANS: D REF: 14-4 Area and the Law of Sines
60. ANS: A REF: 14-5 The Law of Cosines