MAC 1105: Final Exam Review

Due Monday, May 5th. The final exam is on Monday, May 5th at 7:30pm.

Find the center-radius form of the equation of the circle.
1) center (-6, -4), radius 3
   A) \((x - 6)^2 + (y - 4)^2 = 9\)
   B) \((x + 6)^2 + (y + 4)^2 = 9\)
   C) \((x + 4)^2 + (y + 6)^2 = 3\)
   D) \((x - 4)^2 + (y - 6)^2 = 3\)

Graph the circle.
2) \((x - 4)^2 + (y - 3)^2 = 9\)

Evaluate the function.
3) Find \(f(3)\) when \(f(x) = 2x^2 - 2x - 5\)
   A) 19
   B) 7
   C) -2
   D) 17

An equation that defines \(y\) as a function of \(x\) is given. Solve for \(y\) in terms of \(x\), and replace \(y\) with the function notation \(f(x)\).
4) \(x + 5y = 6\)
   A) \(f(x) = 5x - 6\)
   B) \(f(x) = -x + \frac{6}{5}\)
   C) \(f(x) = -\frac{1}{5}x + \frac{6}{5}\)
   D) \(f(x) = \frac{1}{5}x + \frac{6}{5}\)
Determine the intervals over which the function is decreasing, increasing, and constant.

5) 

A) Increasing \([-1, \infty)\); Decreasing \((-\infty, -1]\)  
B) Increasing \((-\infty, 1]\); Decreasing \([1, \infty)\)  
C) Increasing \((-\infty, -1]\); Decreasing \([-1, \infty)\)  
D) Increasing \([1, \infty)\); Decreasing \((-\infty, 1]\)

6) 

A) Increasing \((-\infty, 3]\); Decreasing \([-3, \infty)\); Constant \([-3, 3]\)  
B) Increasing \([3, \infty)\); Decreasing \([-3, \infty)\); Constant \([-3, 3]\)  
C) Increasing \((-\infty, 3]\); Decreasing \((-\infty, -3]\); Constant \([-3, 3]\)  
D) Increasing \([3, \infty)\); Decreasing \((-\infty, -3]\); Constant \([-3, 3]\)

Solve the quadratic inequality. Write the solution set in interval notation.

7) \(x^2 - 2x - 24 < 0\)  
A) \((-4, 6)\)  
B) \((-\infty, -4)\)  
C) \((-\infty, -4) \cup (6, \infty)\)  
D) \((6, \infty)\)

8) \(x^2 + 6x - 7 \geq 0\)  
A) \([-7, 1]\)  
B) \((-\infty, -7] \cup [1, \infty)\)  
C) \([1, \infty)\)  
D) \((-\infty, -7]\)

Solve. Provide answers in interval notation.

9) \((x + 8)(x + 7)(x - 7) < 0\)  
A) \((-\infty, -7)\)  
B) \((-\infty, -8) \cup (-7, 7)\)  
C) \((7, \infty)\)  
D) \((-8, -7) \cup (7, \infty)\)
Solve the rational inequality. Write the solution set in interval notation.

10) \( \frac{x - 7}{x + 8} \leq 0 \)
   A) \([-7, 8]\)       B) \([-8, 7]\)       C) \((-7, 8]\)       D) \((-8, 7]\)

11) \( \frac{x + 11}{x + 7} < 5 \)
   A) \((-\infty, -6) \cup (7, \infty)\)       B) \((-7, -6)\)
   C) \((-\infty, -7) \cup (-6, \infty)\)       D) \(\emptyset\)

For the points P and Q, find the distance d(P, Q).

12) P\((-7, -1)\), Q\((5, -3)\)
   A) 14       B) \(140\sqrt{35}\)       C) 140       D) \(2\sqrt{37}\)

For the points P and Q, find the coordinates of the midpoint of the segment PQ.

13) P\((3, -9)\), Q\((-9, 1)\)
   A) \((-6, -8)\)       B) \((6, -5)\)       C) \((-3, -4)\)       D) \((12, -10)\)

Graph the linear function and give the domain and the range. If the function is a constant function, identify it as such.

14) \(f(x) = -5x + 2\)

15) \(6x - 36y = 36\)
Find the slope of the line satisfying the given conditions.

17) through (1, -5) and (-4, -3)
   A) \( -\frac{5}{2} \)  
   B) \( \frac{2}{5} \)  
   C) \( \frac{5}{2} \)  
   D) \( \frac{2}{5} \)  
   17) _____

18) vertical, through (7, -1)
   A) -1  
   B) 0  
   C) undefined  
   D) 1  
   18) _____

19) horizontal, through (-6, -9)
   A) 1  
   B) undefined  
   C) 0  
   D) -1  
   19) _____

Solve the problem.

20) The rate of return of certain investments increases as the risk factor of the investment increases. An investment with a risk factor of 2 has a rate of return of 5.0%. An investment with a risk factor of 16 has a rate of return of 14.0%. What is the average rate of change in return per unit of risk? Round to two decimal places.
   A) 0.64% per unit risk  
   B) 1.56% per unit risk  
   C) 1.09% per unit risk  
   D) 0.92% per unit risk  
   20) _____

21) A deep sea diving bell is being lowered at a constant rate. After 11 minutes, the bell is at a depth of 300 ft. After 40 minutes the bell is at a depth of 1800 ft. What is the average rate of change of depth? Round to one decimal place.
   A) 51.7 ft per minute  
   B) 45.0 ft per minute  
   C) 0.02 ft per minute  
   D) 37.5 ft per minute  
   21) _____

Write an equation for the line described. Give your answer in slope-intercept form.

22) \( m = -5 \), through (-7, 9)
   A) \( y = -5x - 26 \)  
   B) \( y = -5x + 33 \)  
   C) \( y = 5x - 24 \)  
   D) \( 5x + y = 26 \)  
   22) _____

23) horizontal, through (3, -5)
   A) \( y = 3 \)  
   B) \( y = -5 \)  
   C) \( x = 3 \)  
   D) \( x = -5 \)  
   23) _____

24) vertical, through (2, -1)
   A) \( y = 2 \)  
   B) \( x = -1 \)  
   C) \( x = 2 \)  
   D) \( y = -1 \)  
   24) _____
Write an equation for the line described. Write the equation in the form specified.

25) parallel to \( y = -2 \), through (8, 4)
   A) \( y = 8 \)  
   B) \( y = -2 \)  
   C) \( y = 4 \)  
   D) \( y = -4 \)  

26) perpendicular to \( x = -7 \), through (4, 1)
   A) \( x = 4 \)  
   B) \( y = 4 \)  
   C) \( y = 1 \)  
   D) \( x = 1 \)  

27) perpendicular to \(-5x + y = 7\), through (4, 3); slope-intercept form
   A) \( y = -\frac{1}{5}x + \frac{19}{5} \)  
   B) \( y = -\frac{1}{5}x + \frac{19}{5} \)  
   C) \( y = -5x - 19 \)  
   D) \( y = \frac{1}{5}x - \frac{19}{5} \)  

Find the domain, range, x-intercepts, and y-intercepts. Then graph the function.

28) \( f(x) = x^3 - 2 \)  

29) \( g(x) = -\sqrt{x + 2} - 1 \)
30) \( f(x) = \frac{1}{5}(x + 4)^3 \)

The figure below shows the graph of a function \( y = f(x) \). Use this graph to solve the problem.

31) Sketch the graph of \( y = -f(x) \).

Find the domain, range, \( x \)-intercepts, \( y \)-intercepts, vertex, and axis of symmetry for each. Then graph.

32) \( y = x^2 - 20x + 101 \)
33) \( f(x) = -\frac{1}{2}(x + 2)^2 - 3 \)

34) \( y = x^2 + 2x - 7 \)

35) \( y = (x + 2)^2 - 9 \)
Find the domain, x-intercepts, y-intercept, multiplicities, and end behavior. Then graph.

36) \( f(x) = (x - 6)(x + 5)(x - 3) \)

37) \( f(x) = (x + 3)^2 (x - 5)^2 (x - 2)^4 (-x)^3 \)

38) \( f(x) = x (x - 3)^4 (x + 6)^6 (x - 5)^3 (-x - 3)^4 \)
Use the graph to answer the question.

39) Find the domain and range of the rational function graphed below.

![Graph](image)

A) Domain: \((-\infty, 2) \cup (2, \infty)\); Range: \((-\infty, 1) \cup (1, \infty)\)
B) Domain: \((-\infty, 1) \cup (1, \infty)\); Range: \((-\infty, 2) \cup (2, \infty)\)
C) Domain: \((-\infty, 1) \cup (1, \infty)\); Range: \((-\infty, \infty)\)
D) Domain: \((-\infty, \infty)\); Range: \((-\infty, 2) \cup (2, \infty)\)

40) Find the horizontal and vertical asymptotes of the rational function graphed below.

![Graph](image)

A) Horizontal: none; vertical: \(x = \pm 2\)
B) Horizontal: \(y = \pm 2\); vertical: \(x = -1\)
C) Horizontal: \(y = -1\); vertical: \(x = \pm 2\)
D) Horizontal: \(y = 0\); vertical: \(x = \pm 2\)

Find the horizontal asymptote of the given function.

41) \(f(x) = \frac{4x^2 + 7}{4x^2 - 7}\)

A) \(y = 1\)  
B) \(y = 7\)  
C) None  
D) \(y = -7\)

42) \(g(x) = \frac{x + 9}{x^2 - 6}\)

A) \(y = 1\)  
B) \(y = 0\)  
C) None  
D) \(y = 6\)
Find the domain, x-intercepts, y-intercept, vertical asymptotes, horizontal asymptotes, and any test points that are needed. Then graph the function.

43) \( f(x) = \frac{x - 3}{x + 4} \)

Find the domain, x-intercepts, y-intercept, vertical asymptotes, horizontal asymptotes, and any test points that are needed. Then graph the function.

44) \( f(x) = \frac{3}{x + 3} \)

Find the domain, x-intercepts, y-intercept, vertical asymptotes, horizontal asymptotes, and any test points that are needed. Then graph the function.

45) \( f(x) = \frac{x + 2}{x^2 - 16} \)
46) \( f(x) = \frac{2x}{x^2 + 7x + 6} \)

47) \( f(x) = \frac{x^2 + 6x - 7}{x^2 - x - 6} \)

**Evaluate.**

48) Find \((f - g)(5)\) when \(f(x) = -2x^2 + 5\) and \(g(x) = x - 6\).
   
   \[ \begin{align*}
   A) & -34 & B) & -44 & C) & 40 & D) & -56
   \end{align*} \]

49) Find \(\left(\frac{f}{g}\right)(-2)\) when \(f(x) = 4x - 7\) and \(g(x) = 4x^2 + 14x + 2\).
   
   \[ \begin{align*}
   A) & \frac{3}{2} & B) & -\frac{2}{5} & C) & -\frac{2}{5} & D) & 4
   \end{align*} \]

**For the pair of functions, find the indicated sum, difference, product, or quotient.**

50) \(f(x) = 9x - 4, \ g(x) = 7x - 9\)

Find \((f - g)(x)\).

\[ \begin{align*}
   A) & 2x + 5 & B) & 16x - 13 & C) & 2x - 13 & D) & -2x - 5
   \end{align*} \]
51) \( f(x) = 5x^2 - 8x, \ g(x) = x^2 - 5x - 24 \)

Find \( \left( \frac{f}{g} \right)(x) \).

A) \( \frac{5x - 8}{-5} \)  
B) \( \frac{5 - x}{24} \)  
C) \( \frac{5x^2 - 8x}{x^2 - 5x - 24} \)  
D) \( \frac{5x}{x + 1} \)

Find the specified domain.

52) Find the domain of \( (f - g)(x) \) when \( f(x) = 6x - 3 \) and \( g(x) = 3x - 7 \).

A) \( (-\infty, \infty) \)  
B) \( (-\infty, 3) \)  
C) \( (-6, 3) \)  
D) \( (-3, 6) \)

53) Find the domain of \( (f + g)(x) \) when \( f(x) = \sqrt{8x - 4} \) and \( g(x) = \frac{1}{x} \).

A) \( \left[ \frac{1}{2}, 0 \right) \cup (0, \infty) \)  
B) \( (-\infty, 0) \cup (0, \infty) \)  
C) \( \left[ \frac{1}{2}, \infty \right) \)  
D) \( \left( -\infty, \frac{1}{2} \right] \)

54) Find the domain of \( \left( \frac{f}{g} \right)(x) \) when \( f(x) = 2x - 6 \) and \( g(x) = 5x - 2 \).

A) \( \left( -\infty, \frac{2}{5} \right) \cup \left( \frac{2}{5}, 3 \right) \cup (3, \infty) \)  
B) \( (-\infty, 3) \cup (3, \infty) \)  
C) \( \left[ \frac{2}{5}, \infty \right) \)  
D) \( (-\infty, \frac{2}{5}) \)

Compute and simplify the difference quotient \( \frac{f(x + h) - f(x)}{h} \), \( h \neq 0 \).

55) \( f(x) = 8x - 15 \)

A) \( \frac{15}{8} \)  
B) \(-15h\)  
C) \( 15 \)  
D) \( 8 \)

56) \( f(x) = 3x^2 + 5x \)

A) \( 6x^2 + 3h + 5x \)  
B) \( 6x + 5 \)  
C) \( 6x + 3h + 5 \)  
D) \( 9x - 5h + 10 \)

Find the requested function value.

57) Find \( (f \circ g)(3) \) when \( f(x) = 7x - 6 \) and \( g(x) = 5x^2 - 7x - 6 \).

A) \(-90\)  
B) \( 1014 \)  
C) \(-36\)  
D) \( 120 \)

For the given functions \( f \) and \( g \), find the indicated composition.

58) \( f(x) = 7x + 14, \ g(x) = 4x - 1 \)

\( (f \circ g)(x) \)

A) \( 28x + 13 \)  
B) \( 28x + 7 \)  
C) \( 28x + 55 \)  
D) \( 28x + 21 \)

59) \( f(x) = \frac{6}{x - 4}, \ g(x) = \frac{3}{4x} \)

\( (f \circ g)(x) \)

A) \( \frac{3x - 12}{24x} \)  
B) \( \frac{24x}{3 + 16x} \)  
C) \( \frac{24x}{3 - 16x} \)  
D) \( \frac{6x}{3 - 16x} \)
Determine whether or not the function is one-to-one.

60)

![Graph of a function with points at (6, 4), (8, 4), and (10, 4).]

A) No

B) Yes

61)

![Graph of a function with points at (-5, -4), (-3, -2), and (-1, 0).]

A) Yes

B) No

Determine whether or not the function is one-to-one.

62) \( f(x) = 2x^3 - 7 \)

A) Yes

B) No

63) \( f(x) = \sqrt{25 - x^2} \)

A) Yes

B) No

Decide whether the given functions are inverses.

64)

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<tr>
<th>( x )</th>
<th>4</th>
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<td>( f(x) )</td>
<td>4</td>
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<td>10</td>
<td>12</td>
</tr>
<tr>
<td>( g(x) )</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
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</table>

A) No

B) Yes

65) \( f = \{-1, -5\}, \{0, 3\}, \{3, -1\}, \{7, 9\}\)

\( g = \{-5, -1\}, \{3, 0\}, \{-1, 3\}, \{9, 7\}\)

A) Yes

B) No
Decide whether or not the functions are inverses of each other.

66) A) Yes  
B) No

67) A) Yes  
B) No

68) A) No  
B) Yes

69) \( f(x) = 6x - 8 \), \( g(x) = \frac{x + 6}{8} \)  
A) No  
B) Yes
70) \( f(x) = 8x - 8, \quad g(x) = \frac{1}{8}x + 1 \)
   A) No \hspace{1cm} B) Yes

71) \( f(x) = 2x + 4, \quad g(x) = \frac{1}{2}x - 2 \)
   A) Yes \hspace{1cm} B) No

72) \( f(x) = 6x^2 + 2, \text{ domain } [0, \infty); \quad g(x) = \sqrt{\frac{x - 2}{6}}, \text{ domain } [2, \infty) \)
   A) Yes \hspace{1cm} B) No

If \( f \) is one-to-one, find an equation for its inverse.

73) \( f(x) = 7x - 4 \)
   A) \( f^{-1}(x) = \frac{x - 4}{7} \) \hspace{1cm} B) \( f^{-1}(x) = \frac{x}{7} + 4 \)
   C) Not a one-to-one function \hspace{1cm} D) \( f^{-1}(x) = \frac{x + 4}{7} \)

74) \( f(x) = x^3 - 1 \)
   A) \( f^{-1}(x) = \sqrt[3]{x + 1} \) \hspace{1cm} B) \( f^{-1}(x) = \sqrt[3]{x - 1} \)
   C) Not a one-to-one function \hspace{1cm} D) \( f^{-1}(x) = \sqrt[3]{x + 1} \)

75) \( f(x) = \frac{9}{x + 8} \)
   A) \( f^{-1}(x) = \frac{x}{8 + 9x} \) \hspace{1cm} B) Not a one-to-one function
   C) \( f^{-1}(x) = \frac{8 + 9x}{x} \) \hspace{1cm} D) \( f^{-1}(x) = \frac{-8x + 9}{x} \)

76) \( f(x) = \sqrt{x + 9}, \ x \geq -9 \)
   A) \( f^{-1}(x) = \sqrt{x - 9} \) \hspace{1cm} B) Not a one-to-one function
   C) \( f^{-1}(x) = x^2 - 9, \ x \geq 0 \) \hspace{1cm} D) \( f^{-1}(x) = (x + 9)^2 \)

Find the domain and range of the inverse of the given function.

77) \( f(x) = 2x - 3 \)
   A) Domain: all real numbers, range: \((-\infty, -3]\) \hspace{1cm} B) Domain: \((-\infty, -3]\); range: all real numbers
   C) Domain and range: all real numbers \hspace{1cm} D) Domain: \([2, \infty); \ range: \ (-\infty, -3]\)

78) \( f(x) = \frac{1}{x - 2} \)
   A) Domain: \((-\infty, 0) \cup (0, \infty); \ range \ (-\infty, 2) \cup (2, \infty) \)
   B) Domain all real numbers; range \((-\infty, 2) \cup (2, \infty) \)
   C) Domain: \((-\infty, 2) \cup (2, \infty); \ range \ (-\infty, 0) \cup (0, \infty) \)
   D) Domain and range are all real numbers
79) \( f(x) = \sqrt{x - 9} \)
- A) Domain: \([0, \infty); \) range: \([9, \infty)\)
- B) Domain and range: all real numbers
- C) Domain: all real numbers; range: \([9, \infty)\)
- D) Domain: \([9, \infty); \) range: \([0, \infty)\)

Find the function value. If the result is irrational, round your answer to the nearest thousandth.
80) Let \( f(x) = \left(\frac{1}{4}\right)^x \). Find \( f(3) \).
- A) \( \frac{1}{8} \)
- B) 64
- C) \( \frac{1}{64} \)
- D) \( \frac{1}{12} \)

Graph the exponential function using transformations where appropriate.
81) \( f(x) = -3^x - 3 \)

82) \( f(x) = \left(\frac{1}{2}\right)^x + 2 \)

Solve the equation.
83) \( 36^x = 6 \)
- A) \( -\frac{1}{2} \)
- B) \(-2\)
- C) \(2\)
- D) \(\frac{1}{2}\)
84) \(3^{-x} = \frac{1}{81}\)
   A) \([-4]\)   B) \([4]\)   C) \(\left\{\frac{1}{27}\right\}\)   D) \(\left\{\frac{1}{9}\right\}\)

85) \(2(7 - 3x) = \frac{1}{4}\)
   A) \(\left\{\frac{1}{2}\right\}\)   B) \([3]\)   C) \([-3]\)   D) \([1]\)

86) \(4 = b \frac{2}{5}\)
   A) \(\{2\}\)   B) \(\{-2, 2\}\)   C) \(\{-32, 32\}\)   D) \(\{32\}\)

87) \(e^{5x} - 1 = (e^4)^{-x}\)
   A) \(\{1\}\)   B) \(\{0\}\)   C) \(\left\{\frac{1}{9}\right\}\)   D) \(\left\{\frac{5}{6}\right\}\)

88) \(m^{-4} = \frac{1}{81}\)
   A) \(\{-3, 3\}\)   B) \(\left\{\frac{1}{3}\right\}\)   C) \(\{3\}\)   D) \(\{81\}\)

89) \(\left\{\frac{1}{3}\right\}^{3x + 6} = 9x - 5\)
   A) \(\left\{-\frac{1}{4}\right\}\)   B) \(\left\{-\frac{1}{5}\right\}\)   C) \(\left\{\frac{4}{5}\right\}\)   D) \(\left\{\frac{16}{3}\right\}\)

Find the future value.
90) $5481 invested for 4 years at 4% compounded annually
   A) $6426.90   B) $6430.30   C) $6421.87   D) $6411.99

Find the present value of the future value.
91) $4000, invested for 8 years at 6% compounded quarterly
   A) $2483.97   B) $6393.30   C) $6441.30   D) $2531.97

Solve the problem.
92) Find the required annual interest rate, to the nearest tenth of a percent, for $994 to grow to $1520 if interest is compounded monthly for 2 years.
   A) 14.3%   B) 21.4%   C) 1.8%   D) 42.9%

93) Find out how long it takes a $3500 investment to earn $300 interest if it is invested at 7% compounded semiannually. Round to the nearest tenth of a year. Use the formula \(A = P\left(1 + \frac{r}{n}\right)^{nt}\).
   A) 1.2 years   B) 1.4 years   C) 1.6 years   D) 1 years
94) Cindy will require $16,000 in 3 years to return to college to get an MBA degree. How much money should she ask her parents for now so that, if she invests it at 11% compounded continuously, she will have enough for school? (Round your answer to the nearest dollar.)
A) $11,699   B) $8270   C) $11,503   D) $22,255

Evaluate the logarithm.
95) \( \log_{8} \frac{1}{64} \)
A) -2   B) -8   C) 2   D) 8

96) \( \log_{10} 0.001 \)
A) 2   B) 0   C) -1   D) -3

Write in logarithmic form.
97) \( 6^2 = 36 \)
A) \( \log_6 2 = 36 \)   B) \( \log_6 36 = 2 \)   C) \( \log_2 36 = 6 \)   D) \( \log_{36} 6 = 2 \)

98) \( 3^{-3} = \frac{1}{27} \)
A) \( \log_3 \frac{1}{27} = -3 \)   B) \( \log_{-3} \frac{1}{27} = 3 \)   C) \( \log_{1/27} 3 = -3 \)   D) \( \log_3 -3 = \frac{1}{27} \)

Write an equivalent expression in exponential form.
99) \( \log_4 64 = 3 \)
A) \( 3^4 = 64 \)   B) \( 64^3 = 4 \)   C) \( 4^{64} = 3 \)   D) \( 4^3 = 64 \)

Solve the equation.
100) \( \log_3 81 = x \)
A) \( \{27\} \)   B) \( \{84\} \)   C) \( \{4\} \)   D) \( \{243\} \)

101) \( \log_5 \frac{1}{125} = x \)
A) \( \left\{ \frac{1}{25} \right\} \)   B) \( \{-3\} \)   C) \( \left\{ \frac{1}{625} \right\} \)   D) \( \{3\} \)

102) \( x = \log_4 \sqrt[4]{16} \)
A) \( \{2\} \)   B) \( \left\{ \frac{1}{2} \right\} \)   C) \( \{8\} \)   D) \( \left\{ -\frac{1}{2} \right\} \)
Graph the function. Give the domain and range.

103) \( f(x) = \log_3 x + 4 \)

104) \( f(x) = \log_{1/3} (x + 2) \)

Write the expression as a sum, difference, or product of logarithms. Assume that all variables represent positive real numbers.

105) \( \log_a(8x^5y) \)
   A) \( \log_a 8 + 5 \log_a x + \log_a y \)
   B) \( \log_a(8 + x^5 + y) \)
   C) \( (\log_a 8)(\log_a x)(\log_a y) \)
   D) \( \log_a 8 + (\log_a x)^5 + \log_a y \)

106) \( \log_4 \left( \frac{4\sqrt{4}}{5} \right) \)
   A) \( \frac{\log_4 4 + \frac{1}{2} \log_4 4}{\log_4 5} \)
   B) \( \log_4 4 + \frac{1}{2} \log_4 4 - \log_4 5 \)
   C) \( (\log_4 4) \left( \frac{1}{2} \log_4 4 \right) - \log_4 5 \)
   D) \( \log_4 4 + \sqrt{\log_4 4} - \log_4 5 \)
Use the product, quotient, and power rules of logarithms to rewrite the expression as a single logarithm. Assume that all variables represent positive real numbers.

107) \( \log_2 7 - \log_2 z \)
   A) \( \log_4 \left( \frac{7}{z} \right) \)
   B) \( \log_2 \left( \frac{7}{z} \right) \)
   C) \( \log_2 \left( \frac{z}{7} \right) \)
   D) \( \log_2 (7 - z) \)

108) \( (\log_a q - \log_a r) + 6 \log_a p \)
   A) \( \log_a (q + p^6 - r) \)
   B) \( \log_a \left( \frac{6qp}{r} \right) \)
   C) \( \log_a \left( \frac{q}{p^6r} \right) \)
   D) \( \log_a \frac{qp^6}{r} \)

Use the change of base rule to find the logarithm to four decimal places.

109) \( \log_4 2 \)
   A) 0.5000
   B) -0.5000
   C) 1.0000
   D) 2.0000

110) \( \log_9 0.707 \)
   A) -0.1506
   B) 12.7298
   C) -0.1578
   D) -6.3371

Solve the equation and express the solution in exact form.

111) \( \ln(21x - 7) = \ln 8 \)
   A) \( \left\{ \frac{5}{7} \right\} \)
   B) \( \left\{ \frac{2}{3} \right\} \)
   C) \( \left\{ -\frac{5}{7} \right\} \)
   D) \( \left\{ \frac{1}{21} \right\} \)

112) \( \log_9 (x - 4) + \log_9 (x - 4) = 1 \)
   A) \( \{-\sqrt{17}, \sqrt{17}\} \)
   B) \( \{7\} \)
   C) \( \{-7, 7\} \)
   D) \( \{\sqrt{17}\} \)

Solve the equation by expressing each side as a power of the same base and then equating exponents.

113) \( 5^x = 25 \)
   A) \{1\}
   B) \{3\}
   C) \{2\}
   D) \{5\}

114) \( 2^{(3x - 7)} = 4 \)
   A) \{1\}
   B) \{\frac{1}{2}\}
   C) \{-3\}
   D) \{3\}

115) \( 4^x + 10 = 8x - 6 \)
   A) 28
   B) 26
   C) 16
   D) 38

Solve the exponential equation. Express the solution set in terms of natural logarithms.

116) \( e^{4x} = 7 \)
   A) \( \left\{ \frac{\ln 7}{4} \right\} \)
   B) \{4 \ln 7\}
   C) \( \left\{ \frac{\ln 7}{4} \right\} \)
   D) \( \left\{ \frac{\ln 4}{7} \right\} \)
117) \(4x + 4 = 52x + 5\)
A) \([7 \ln 5 - 5 \ln 4]\)  
B) \([\ln 5 - \ln 4]\)  
C) \(\left\{\frac{5 \ln 5 - 4 \ln 4}{\ln 5 - 2 \ln 5}\right\}\)  
D) \(\left\{\ln \left[\frac{5^5}{4^4} - \frac{4}{5^2}\right]\right\}\)  

118) \(\log_6(x - 3) = 2\)
A) \(39\)  
B) \(67\)  
C) \(33\)  
D) \(61\)  

119) \(4 + 5 \ln x = 12\)
A) \(\left\{\frac{8}{5 \ln 1}\right\}\)  
B) \(\left\{e^{8/5}\right\}\)  
C) \(\left\{\ln \frac{8}{5}\right\}\)  
D) \(\left\{\frac{e^8}{5}\right\}\)  

120) \(\log_3(x + 5) = 2 + \log_3(x - 1)\)
A) \(\left\{-\frac{7}{4}\right\}\)  
B) \(\left\{\frac{7}{4}\right\}\)  
C) \(\left\{-\frac{3}{4}\right\}\)  
D) \(\left\{\frac{3}{4}\right\}\)  

121) \(\log x + \log(x - 1) = \log 2\)
A) \(-1\)  
B) \(\left\{\frac{3}{2}\right\}\)  
C) \(\{2, -1\}\)  
D) \(\{2\}\)  

Solve.

122) The value of a particular investment follows a pattern of exponential growth. In the year 2000, you invested money in a money market account. The value of your investment \(t\) years after 2000 is given by the exponential growth model \(A = 5000e^{0.068t}\). By what percentage is the account increasing each year?  
A) 6.8\%  
B) 7.5\%  
C) 7.4\%  
D) 7.2\%  

123) The function \(A = A_0e^{-0.00866x}\) models the amount in pounds of a particular radioactive material stored in a concrete vault, where \(x\) is the number of years since the material was put into the vault. If 300 pounds of the material are initially put into the vault, how many pounds will be left after 30 years?  
A) 231 pounds  
B) 400 pounds  
C) 56 pounds  
D) 47 pounds  

124) The population of a particular country was 25 million in 1983; in 1993, it was 32 million. The exponential growth function \(A = 25e^{kt}\) describes the population of this country \(t\) years after 1983. Use the fact that 10 years after 1983 the population increased by 7 million to find \(k\) to three decimal places.  
A) 0.668  
B) 0.025  
C) 0.195  
D) 0.035  

125) The half-life of silicon-32 is 710 years. If 70 grams is present now, how much will be present in 400 years? (Round your answer to three decimal places.)  
A) 67.319  
B) 47.37  
C) 1.41  
D) 0
Solve the problem.

126) The sum of two numbers is 4. If one number is subtracted from the other, their difference is −12.
Find the numbers.
A) 4, 8  B) −4, −8  C) −4, 8  D) 1, 3

127) Two cars leave a city and head in the same direction. After 5 hours, the faster car is 55 miles ahead of the slower car. The slower car has traveled 215 miles. Find the speeds of the two cars.
A) 110 mph and 121 mph  B) 45 mph and 56 mph  C) 32 mph and 43 mph  D) 43 mph and 54 mph

128) You invested $12,000 and started a business selling vases. Supplies cost $20 per vase and you are selling each vase for $35. Let x represent the number of vases produced and sold and write the cost function, C, and revenue function, R.
A) C(x) = 20x + 12,000  R(x) = 35x
B) C(x) = 20x + 12,000x  R(x) = 35x
C) C(x) = 20x + 35  R(x) = 12,000x
D) C(x) = 20x + 12,000  R(x) = 35x

129) As the price of a product increases, the demand for that product decreases. However, at higher prices, suppliers are willing to produce greater quantities of the product. The weekly supply and demand models for a certain type of television are as follows:
Demand:  N = −5p + 770
Supply:  N = 2.4p
where p is the price in dollars per television.
How many of these televisions can be sold and supplied at $80 per television?

Solve the system of equations.

130) \[ \begin{align*}
x + y + z &= -6 \\
x - y + 4z &= 6 \\
5x + y + z &= -26
\end{align*} \]
A) \{(-5, -3, 2)\}  B) \{(2, -5, -3)\}  C) \{(2, -3, -5)\}  D) \{(-3, -5, 2)\}

131) \[ \begin{align*}
x + 4y + 5z &= -15 \\
3y + 3z &= -6 \\
z &= -4
\end{align*} \]
A) \{(2, -3, -4)\}  B) \{(-4, 2, -3)\}  C) \{(-3, -4, 2)\}  D) \{(-3, 2, -4)\}

Solve the system by the substitution method.

132) \[ \begin{align*}
y &= x - 4 \\
y^2 &= -16x
\end{align*} \]
A) \{(-4, -8), (-4, 8), (4, 0)\}  B) \{(-4, -8)\}  C) \{(-4, -8), (-4, 8)\}  D) \{(-4, -8), (4, 0)\}

133) \[ \begin{align*}
xy &= 90 \\
x + y &= -19
\end{align*} \]
A) \{(-9, 10), (-10, 9)\}  B) \{(-9, -10), (-10, -9)\}  C) \{(9, -10), (10, -9)\}  D) \{(9, 10), (10, 9)\}
134) \[ x^2 = y^2 + 39 \]
\[ x - y = 3 \]
A) \((-8, 5)\)  B) \((-8, -5)\)  C) \((8, 5)\)  D) \((8, -5)\)

Solve the system by the addition method.

135) \[ x^2 + y^2 = 36 \]
\[ x^2 - y^2 = 36 \]
A) \((6, 0), (-6, 0)\)  B) \((6, 0)\)  C) \((0, 6)\)  D) \((0, 6), (0, -6)\)

136) \[ x^2 + y^2 + 4x + 6y - 12 = 0 \]
\[ x^2 - y^2 + 4x - 6y - 30 = 0 \]
A) \((-2, -2), (-2, 8)\)  B) \((-2, 2), (-2, -8)\)  C) \((3, -3), (7, -3)\)  D) \((3, -3), (-7, -3)\)

Let \(x\) represent one number and let \(y\) represent the other number. Use the given conditions to write a system of nonlinear equations. Solve the system and find the numbers.

137) The sum of two numbers is \(-7\) and their product is \(-8\). Find the numbers.
A) \(-1\) and \(8\)  B) \(1\) and \(-8\); \(-1\) and \(8\)  C) \(1\) and \(-8\)  D) \(1\) and \(8\); \(-1\) and \(-8\)

138) The difference between the squares of two numbers is \(84\). Twice the square of the second number subtracted from the square of the first number is \(68\). Find the numbers.
A) \(10\) and \(4\)  B) \(10\) and \(4\); \(-10\) and \(4\); \(10\) and \(-4\)  C) \(10\) and \(4\); \(-10\) and \(-4\)  D) \(10\) and \(4\); \(-10\) and \(4\); \(10\) and \(-4\); \(-10\) and \(-4\)

Solve the problem.

139) Find the dimensions of a rectangle whose perimeter is \(42\) feet and whose area is \(104\) square feet.
A) \(9\) feet by \(12\) feet  B) \(8\) feet by \(13\) feet  C) \(7\) feet by \(12\) feet  D) \(7\) feet by \(14\) feet

140) The area of a garden is \(1920\) square feet, and the length of its diagonal is \(68\) feet. Find the dimensions of the garden.
A) \(32\) feet by \(60\) feet  B) \(120\) feet by \(16\) feet  C) \(128\) feet by \(15\) feet  D) \(8\) feet by \(240\) feet

141) A right triangle has an area of \(7\) square inches. The square of the hypotenuse is \(53\). Find the lengths of the legs of the triangle. Round your answer to the nearest inch.
A) \(1\) inches and \(14\) inches  B) \(4\) inches and \(49\) inches  C) \(4\) inches and \(3.5\) inches  D) \(2\) inches and \(7\) inches
Graph the inequality.
142) \( x + y < -3 \)

Graph the solution set of the system of inequalities or indicate that the system has no solution.
143) \( y \leq x^2 + 2 \)
144) \( y < -x + 3 \)  
\( y > 3x - 3 \)
145) $1 \leq y < 3$

146) $y \geq 3^x$
    
    $y \leq 8$
Answer Key
Testname: FINAL EXAM REVIEW (WHOLE COURSE)

1) B
2)

3) B
4) C
5) A
6) D
7) A
8) B
9) B
10) D
11) C
12) D
13) C
14) $D = (-\infty, \infty)$, $R = (-\infty, \infty)$
15) $D = (-\infty, \infty)$, $R = (-\infty, \infty)$

16) $D = (-\infty, \infty)$, $R = \{3\}$

17) B
18) C
19) C
20) A
21) A
22) A
23) B
24) C
25) C
26) C
27) B
31) Graph showing points (-4, 2), (0, 2), and (2, -4).

32) (10, 1)

33)

34)

35) y-intercept (0, -5); x-intercepts (-5, 0) and (1, 0)
36) 

37) 

38) 

39) B 
40) C 
41) A 
42) B
Answer Key
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43)

44)

45)

46)
Answer Key
Testname: FINAL EXAM REVIEW (WHOLE COURSE)

47) 

48) B  
49) A  
50) A  
51) C  
52) B  
53) C  
54) C  
55) D  
56) C  
57) D  
58) B  
59) C  
60) A  
61) A  
62) A  
63) B  
64) B  
65) A  
66) B  
67) B  
68) B  
69) A  
70) B  
71) A  
72) A  
73) D  
74) A  
75) D  
76) C  
77) C  
78) A  
79) A  
80) C
81)

82)

83) D
84) B
85) B
86) C
87) C
88) A
89) C
90) D
91) A
92) B
93) A
94) C
95) A
96) D
97) B
98) A
99) D
100) C
101) B
102) B
103) domain: \((0, \infty)\); range: \((-\infty, \infty)\)

104) domain: \((-\infty, \infty)\); range: \((-\infty, \infty)\)

105) A
106) B
107) B
108) D
109) A
110) C
111) A
112) B
113) C
114) D
115) D
116) C
117) C
118) A
119) B
120) B
121) D
122) A
123) A
124) B
125) B
126) C
127) D
128) B
Answer Key
Testname: FINAL EXAM REVIEW (WHOLE COURSE)

129) D
130) A
131) D
132) B
133) B
134) C
135) A
136) D
137) C
138) D
139) B
140) A
141) D
142)