Student: _____ **Instructor:** Lisa Savy **Assignment:** PRACTICE FINAL EXAM
Date: _____ **Course:** CSN MATH 124-2001 SPR 2021 Spr 2021

1. Solve the equation. The letters a, b, and c are constants.

   $ax - b = c,\ a \neq 0$

   $x =$ _____ (Simplify your answer.)

2. A rectangular parking lot has a length that is 4 yards greater than the width. The area of the parking lot is 480 square yards. Find the length and the width.

   The parking lot has a width of _____ yards.

   The parking lot has a length of _____ yards.

3. Find the real solutions of the following equation by factoring.

   $x^3 - 8x^2 - 4x + 32 = 0$

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

   - **A.** The solution set is $\{$ _____ $\}$.
     (Use a comma to separate answers as needed.)
   - **B.** There are no real solutions.

4. A bank loaned out $16,000, part of it at the rate of 6% per year and the rest at 14% per year. If the interest received in one year totaled $1500, how much was loaned at 6%?

   How much of the $16,000 did the bank loan out at 6%?

   $ _____

5. Roger can run one mile in 12 minutes. Jeff can run one mile in 10 minutes. If Jeff gives Roger a 1 minute head start, how long will it take before Jeff catches up to Roger? How far will each have run?

   Not including the head start, it will take _____ minutes for Jeff to catch up to Roger.

   They each will have run _____ of a mile.

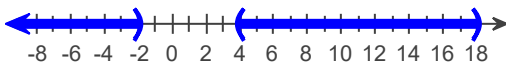
6. Solve the inequality algebraically. Express your answer using set notation or interval notation. Graph the solution set. Verify your results using a graphing utility.

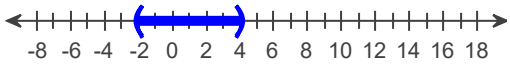
$|x - 1| + 1 < 4$

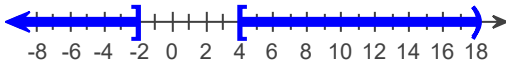
Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

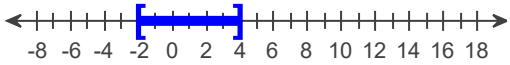
- **A.** The solution set is _____.
  (Type your answer in interval notation. Use integers or fractions for any numbers in the expression.)
- **B.** The solution is the empty set.

Graph the solution set. Choose the correct graph below.

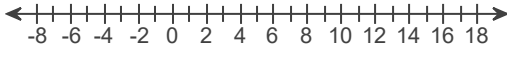
- **A.** 

- **B.** 

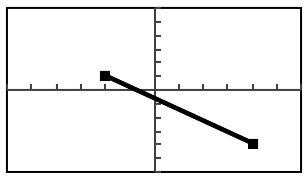
- **C.** 

- **D.** 

- **E.** 

- **F.** 

7. Find the length of the line segment. Then find the midpoint of the line segment. Assume that the endpoints of each line segment have integer coordinates.



Xmin = −12, Xmax = 12, Xscl = 2
Ymin = −12, Ymax = 12, Yscl = 2

The length of the line segment is _____.
(Simplify your answer. Type an exact answer, using radicals as needed.)

The midpoint of the line segment is _____.
(Type an ordered pair.)

8. For the given equation, list the intercepts and test for symmetry.

$x^2 + y - 49 = 0$

What are the intercept(s)? Select the correct choice below and fill in any answer boxes within your choice.

- **A.** _____
  (Type an ordered pair. Use a comma to separate answers as needed.)
- **B.** There are no intercepts.

Is the graph of the equation symmetric with respect to the x-axis?

- Yes
- No

Is the graph of the equation symmetric with respect to the y-axis?

- Yes
- No

Is the graph of the equation symmetric with respect to the origin?

- Yes
- No

9. Use slopes to show that the triangle whose vertices are $(-4,2)$, $(1,5)$, and $(4,0)$ is a right triangle.

Find the slope for the side of the triangle between the vertices $(-4,2)$ and $(1,5)$.

m_1 = _____ (Simplify your answer.)

Find the slope for the side of the triangle between the vertices $(1,5)$ and $(4,0)$.

m_2 = _____ (Simplify your answer.)

Find the slope for the side of the triangle between the vertices $(-4,2)$ and $(4,0)$.

m_3 = _____ (Simplify your answer.)

Why do the preceding results show that the triangle is a right triangle? Choose the correct answer below.

- **A.** Since $m_1 \cdot m_2 = 1$, the triangle has two sides perpendicular.
- **B.** Since $m_1 \cdot m_2 = -1$, the triangle has two sides perpendicular.
- **C.** Since $m_2 \cdot m_3 = -1$, the triangle has two sides perpendicular.
- **D.** Since $m_1 = m_2$, the triangle has two sides perpendicular.

10. For the given functions f and g, complete parts (a)-(h).

$f(x) = x - 2$; $g(x) = 9x^2$

(a) Find $(f + g)(x)$.

$(f + g)(x) =$ _____ (Simplify your answer.)

(b) Find $(f - g)(x)$.

$(f - g)(x) =$ _____ (Simplify your answer.)

(c) Find $(f \cdot g)(x)$.

$(f \cdot g)(x) =$ _____ (Simplify your answer.)

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

$\left(\frac{f}{g}\right)(x) =$ _____ (Simplify your answer.)

(e) Find $(f + g)(4)$.

$(f + g)(4) =$ _____ (Type an integer or a simplified fraction.)

(f) Find $(f - g)(3)$.

$(f - g)(3) =$ _____ (Type an integer or a simplified fraction.)

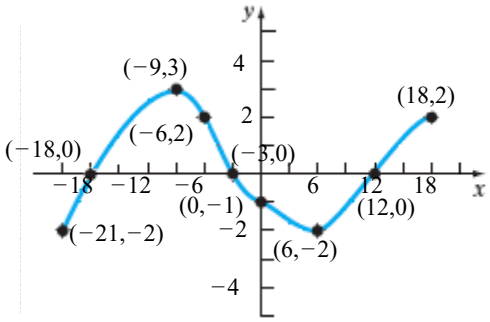
(g) Find $(f \cdot g)(2)$.

$(f \cdot g)(2) =$ _____ (Type an integer or a simplified fraction.)

(h) Find $\left(\frac{f}{g}\right)(1)$.

$\left(\frac{f}{g}\right)(1) =$ _____ (Type an integer or a simplified fraction.)

11. Use the graph of the function f shown to the right to answer parts (a)-(n).



(a) Find f(− 21) and f(− 6).

f(− 21) = _____

f(− 6) = _____

(b) Find f(18) and f(0).

f(18) = _____

f(0) = _____

(c) Is f(6) positive or negative?

- Negative
- Positive

(d) Is f(− 6) positive or negative?

- Negative
- Positive

(e) For what value(s) of x is f(x) = 0?

x = _____

(Use a comma to separate answers as needed.)

(f) For what values of x is f(x) > 0?

_____

(Type a compound inequality. Use a comma to separate answers as needed.)

(g) What is the domain of f?

The domain of f is {x | _____}.

(Type a compound inequality.)

(h) What is the range of f?

The range of f is {y | _____}.

(Type a compound inequality.)

(i) What are the x-intercept(s)?

x = _____

(Type an integer or a simplified fraction. Use a comma to separate answers as needed.)

(j) What are the y-intercept(s)?

y = _____

(Type an integer or a simplified fraction. Use a comma to separate answers as needed.)

(k) How often does the line y = 1 intersect the graph?

_____ time(s)

(l) How often does the line x = 3 intersect the graph?

_____ time(s)

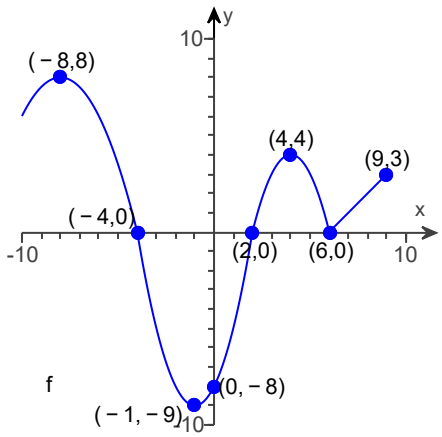
(m) For what value(s) of x does f(x) = − 2?

x = _____
(Use a comma to separate answers as needed.)

(n) For what value(s) of x does f(x) = 3?

x = _____
(Use a comma to separate answers as needed.)

12. Use the graph of the function f. Is f increasing on the interval [0,2]?



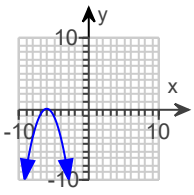
Choose the correct answer below.

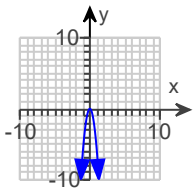
- **A.** The function f is increasing on the interval [0,2] because for any choice of x_1 and x_2 in the interval for which $x_1 < x_2$, $f(x_1) < f(x_2)$.
- **B.** The function f is increasing on the interval [0,2] because for any choice of x_1 and x_2 in the interval for which $x_1 < x_2$, $f(x_1) > f(x_2)$.
- **C.** The function f is not increasing on the interval [0,2] because for any choice of x_1 and x_2 in the interval for which $x_1 < x_2$, $f(x_1) < f(x_2)$.
- **D.** The function f is not increasing on the interval [0,2] because for any choice of x_1 and x_2 in the interval for which $x_1 < x_2$, $f(x_1) > f(x_2)$.

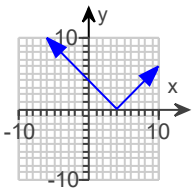
13. Match the graphs with the functions.

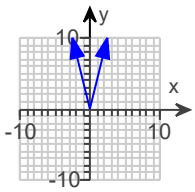
$y=(x-6)^2$ | $y=|x-4|$ | $y=-|x|+4$ | $y=-(x+6)^2$ | $y=4|x|$ | $y=6x^2$ | $y=-4|x|$ | $y=x^2+6$ | $y=-x^2+6$ | $y=-6x^2$ | $y=-|x+4|$ | $y=|x|+4$

Drag the function given above into the appropriate area below to match the graph.









14. The cost C, in dollars, to tow a car is modeled by the function $C(x)=2.5x+85$, where x is the number of miles towed.
(a) What is the cost of towing a car 40 miles?
(b) If the cost of towing a car is $235, how many miles was it towed?
(c) Suppose that you have only $150. What is the maximum number of miles that you can be towed?
(d) What is the domain of C?

(a) The cost is $_____.
(Type an integer or a decimal.)

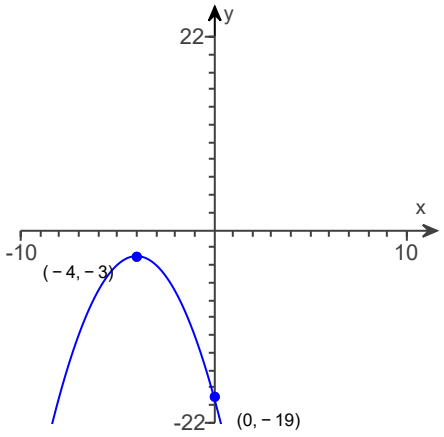
(b) The car was towed _____ miles.
(Type an integer or a decimal.)

(c) The car can be towed a maximum of _____ miles.
(Type an integer or a decimal.)

(d) Choose the correct answer below.

- **A.** $[85,\infty)$
- **B.** $(0,\infty)$
- **C.** $(-\infty,\infty)$
- **D.** $[0,\infty)$

15. Determine the quadratic function whose graph is given below.



The quadratic function which describes the given graph is f(x) = _____.
(Type an expression.)

16. Form a polynomial whose zeros and degree are given.

Zeros: 8, multiplicity 1; 4, multiplicity 2; degree 3

Type a polynomial with integer coefficients and a leading coefficient of 1 in the box below.

f(x) = _____ (Simplify your answer.)

17. Analyze the polynomial function $f(x) = (x+3)^2(1-x)$ using parts (a) through (h) below.

(a) Determine the end behavior of the graph of the function.

The graph of f behaves like y = _____ for large values of $|x|$.

(b) Find the x- and y-intercepts of the graph of the function.

The x-intercept(s) is/are _____.
(Simplify your answer. Type an integer or a fraction. Use a comma to separate answers as needed. Type each answer only once.)

The y-intercept(s) is/are _____.
(Simplify your answer. Type an integer or a fraction. Use a comma to separate answers as needed. Type each answer only once.)

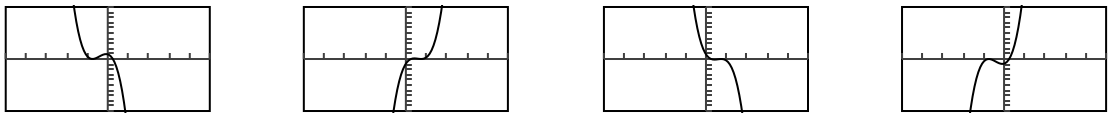
(c) Determine the real zeros of the function and their multiplicity. Use this information to determine whether the graph crosses or touches the x-axis at each x-intercept.

The real zero(s) of f is/are _____.
(Simplify your answer. Type an integer or a fraction. Use a comma to separate answers as needed. Type each answer only once.)

The lesser zero of the function is of multiplicity _____, so the graph of f (1) _____ the x-axis at x = _____. The greater zero of the function is of multiplicity _____, so the graph of f (2) _____ the x-axis at x = _____.

(d) Use a graphing utility to graph the function. The graphs are shown in the viewing window $X_{min} = -20$, $X_{max} = 20$, $X_{scl} = 4$, $Y_{min} = -100$, $Y_{max} = 100$ $Y_{scl} = 10$. Choose the correct graph below.

○ **A.** ○ **B.** ○ **C.** ○ **D.**

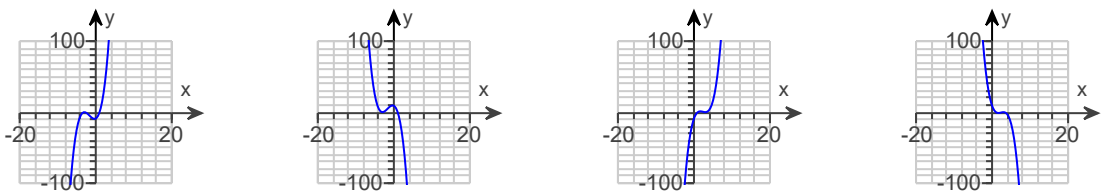


(e) Approximate the turning points of the graph.

The turning point(s) of the graph is/are _____.
(Type an ordered pair. Round each coordinate to the nearest hundredth as needed. Use a comma to separate answers as needed.)

(f) Use the information in parts (a) through (e) to draw a complete graph of the function by hand. Choose the correct graph below.

○ **A.** ○ **B.** ○ **C.** ○ **D.**



(g) From the graph, find the range of the polynomial function.

The range of the polynomial function f is _____.
(Type your answer in interval notation. Round to the nearest hundredth as needed.)

(h) Use the graph to determine where the function is increasing and where it is decreasing.

The function is increasing on the interval(s) _____.
(Type your answer in interval notation. Round to the nearest hundredth as needed. Use a comma to separate answers as needed.)

The function is decreasing on the interval(s) _____.
(Type your answer in interval notation. Round to the nearest hundredth as needed. Use a comma to separate answers as needed.)

(1) ○ touches ○ crosses (2) ○ crosses ○ touches

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18. Find the real zeros of f. Use the real zeros to factor f.

$f(x) = 2x^3 - 21x^2 + 60x - 25$

The real zero(s) of f is/are _____.
(Simplify your answer. Type an exact answer, using radicals as needed. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

Factor f.

f(x) = _____
(Factor completely. Type an exact answer, using radicals as needed. Use integers or fractions for any numbers in the expression.)

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19. The function $f(x) = \frac{7x}{x+3}$ is one-to-one.

(a) Find its inverse and check your answer. (b) Find the domain and the range of f and f^{-1}.

(a) $f^{-1}(x) =$ _____ (Simplify your answer.)

(b) Find the domain of f. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The domain is $\{x|x \leq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **B.** The domain is $\{x|x \neq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **C.** The domain is $\{x|x \geq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **D.** The domain is the set of all real numbers.

Find the range of f. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The range is $\{y|y \geq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **B.** The range is $\{y|y \leq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **C.** The range is $\{y|y \neq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **D.** The range is the set of all real numbers.

Now, find the domain of f^{-1}. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The domain is $\{x|x \neq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **B.** The domain is $\{x|x \geq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **C.** The domain is $\{x|x \leq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **D.** The domain is the set of all real numbers.

Find the range of f^{-1}. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The range is $\{y|y \geq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **B.** The range is $\{y|y \leq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **C.** The range is $\{y|y \neq$ _____$\}$.
  (Type integers or fractions. Use a comma to separate answers as needed.)
- **D.** The range is the set of all real numbers.

20. Solve the equation.

$4^{4x+1} = 16$

The solution set is $\{\quad\}$.
(Type an integer or a simplified fraction. Use a comma to separate answers as needed.)

21. The graph of an exponential function is given. Select the function for each graph from the given options.

$y = 7^{x-1}$ | $y = -7^{x}$ | $y = 7^{1-x}$ | $y = 7^{x} - 1$ | $y = -7^{-x}$ | $y = 7^{-x}$ | $y = 1 - 7^{x}$ | $y = 7^{x}$

Drag each function given above into the area below the appropriate graph, depending on which function is represented by which graph.

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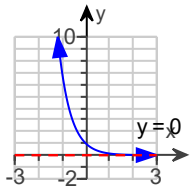

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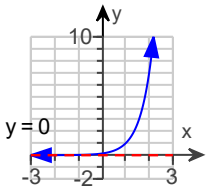

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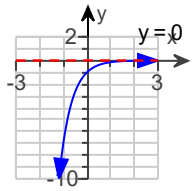

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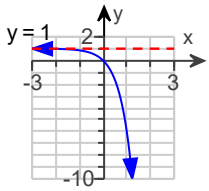

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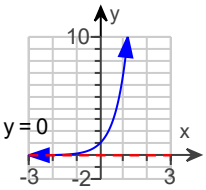

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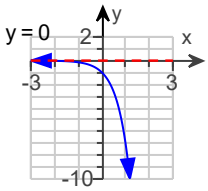

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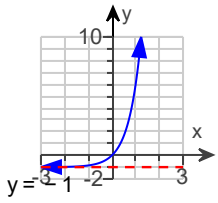

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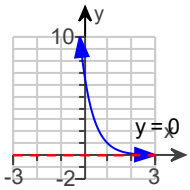

22. Change the logarithmic expression to an equivalent expression involving an exponent

$\log_4 \frac{1}{64} = -3$

The logarithm $\log_4 \frac{1}{64} = -3$ written as an exponential equation is _____.
(Type an equation. Use integers or fractions for any numbers in the equation.)

23. Solve the equation.

$\log_5 (x^2 + 4) = 2$

The solution set is $\{\quad\}$.
(Type an exact answer in simplified form. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

24. Choose the expression equivalent to 7^x.

Which of the following expressions is equivalent to 7^x?

- $e^{7 \ln x}$
- $e^{\log_7 x}$
- e^{7x}
- $e^{x \ln 7}$

25. Write the expression as a sum and/or difference of logarithms. Express powers as factors.

$$\ln \frac{6x\sqrt{1+5x}}{(x-5)^{11}}, \quad x > 5$$

$\ln \frac{6x\sqrt{1+5x}}{(x-5)^{11}} =$ _____ (Simplify your answer.)

26. Solve the following logarithmic equation.

$$2 \log_3 x = -\log_3 9$$

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

- **A.** The solution set is $\{$ _____ $\}$.
  (Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)
- **B.** There is no solution.

27. Use a graphing utility to solve the equation.

$$e^x + \ln x = 5$$

The solution set is $\{$ _____ $\}$.
(Use a comma to separate answers as needed. Round to two decimal places as needed.)

28. Solve the given system of equations. If the system has no solution, say that it is inconsistent.

$$\begin{cases} x - 2y + 3z = 19 \\ 2x + y + z = 8 \\ -3x + 2y - 2z = -21 \end{cases}$$

Select the correct choice below and fill in any answer boxes within your choice.

- **A.** The solution is x = _____, y = _____, and z = _____. (Type integers or simplified fractions.)
- **B.** There are infinitely many solutions. Using ordered triplets, they can be expressed as $\{(x,y,z) \mid x =$ _____, $y =$ _____, z any real number$\}$.
(Simplify your answers. Type expressions using z as the variable as needed.)
- **C.** There are infinitely many solutions. Using ordered triplets, they can be expressed as $\{(x,y,z) \mid x =$ _____, y any real number, z any real number$\}$.
(Simplify your answer. Type an expression using y and z as the variables as needed.)
- **D.** The system is inconsistent.

*29. Find (if possible) **a.** AB and **b.** BA

$$A = \begin{bmatrix} 6 & -8 \\ 2 & -5 \end{bmatrix}, \quad B = \begin{bmatrix} -2 & -9 \\ -3 & -6 \end{bmatrix}$$

a. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

- **A.** AB = _____ (Simplify your answers.)
- **B.** This matrix operation is not possible.

b. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

- **A.** BA = _____ (Simplify your answers.)
- **B.** This matrix operation is not possible.

30. Find the indicated term for the given arithmetic sequence.

The 120th term of 2,4,6,...

a_{120} = _____