Math 124: Algebra with Applications
Spring 2019 **Name (Print):** _____
Problems List

- Evaluate each expression using the order of operations.

1. $3(4) + 3 - 1 + 6^2/2$
2. $7 - 3 \cdot 2 + 6$
3. $\dfrac{2(4 \cdot 8 + 2)}{(2 \cdot 2)}$
4. $10 + 2 \cdot 5 - 20$
5. $\dfrac{3(-6) + 12/(-\sqrt{16}) - 6/(-2)}{\sqrt{25} - 3}$
6. $7 + 2 \cdot 3 - 8$
7. $3(10 - 4) + 6 - 2$
8. $5 - 7 \cdot 3 + 2$
9. $4^2 + 9^2(2 - 1) + 3 - (4^2 - 6)$
10. $\dfrac{7^2 - 5\sqrt{64}}{\sqrt{2^2 + 5}}$
11. $\dfrac{(5 - 2 \cdot (6 + 7))/ - 3}{9 - 8 + (\frac{25}{5} + 1)}$
12. $7 \cdot 2 + 5 - 12$
13. $(3 \cdot 2 + 4) \cdot 5$
14. $(10 - 12) \cdot 5 + 4$
15. $\dfrac{10 - (-4 + 7)}{3 \cdot 2 - 8 + 5 - 2}$
16. $(5 + 11) \cdot (7 + 8)$
17. $10 - 6 \cdot 2(2 + 11) + 1$

- In each statement, fill in the blank with either $=$, $<$, or $>$ to make the resulting statement true.

1. $|-3 + 7|$ ___ $|-3| + |7|$
2. $|24|$ ___ $|-24|$
3. $|-9|$ ___ $|-7|$
4. $|6 + (-2)|$ ___ $|-6 - 2|$
5. $|12|$ ___ $|-6|$
6. $|5 - 2|$ ___ $|2 - 5|$
7. $|-8 + 3|$ ___ $|-8| + |3|$
8. $2 \cdot |-10|$ ___ $|-10| \cdot (20 + 10 - 30)$
9. $|4 - 3|$ ___ $|3 - 4|$
10. $|8 - (-3)|$ ___ $|-3 - 8|$
11. $|-3 + 6|$ ___ $|3 - 6|$
12. $|8 - 5|$ ___ $|2| - |6|$
13. $|7 - 10|$ ___ $|10 - 7|$

- Add, subtract, or multiply as indicated.

1. $(5c + 7)(6c + 8)$
2. $(7k + 5)(k + 3)$
3. $(4x^3 - x^2 + 16) + (2x^3 - 2x^2 + 4)$
4. $(4x^3 + 2x^2 - x) - (3x^3 - 2x^2 + 7x)$
5. $(7b - 3)(2b + 6)$
6. $(5x^4 + 2x^3 + x + 5) \cdot (-6x^3 + 5x - 2)$
7. $(15y^2 + 10x - 18) - (-8y^3 + 8x - 20)$
8. $(4x^3 + 2x^2 + 6) + (6x^3 + 7x^2 + 8)$
9. $(2x + 3)(5x^2 - 3x + 2)$
10. $(12x^3 + 7x^2 - 3x + 1) - (8x^3 + 15x^2 + 5x - 3)$

11. $(x-4)(x^2+3x-6)$
12. $(8x-5)(11+3x)$
13. $(3r+2)(4r^2+3r-5)$
14. $(5x^3+3x^2-6x)-(-5x^3-2x^2-9x)$

- Factor each polynomial as much as possible.

1. $x^2+11x+30$
2. $12r^2+36r^4+6r$
3. $6x^2+18x-36$
4. $x^2+5x-24$
5. $11x^2-77x$
6. x^2-36
7. $x^2+8x+15$
8. $10x^6+50x^3-28x$
9. x^2+6x+9
10. $x^2+4x-12$
11. $36x^{12}-24x^7+12x^5-6x^3$
12. $10x^2+15x^3+20x^4$
13. $x^2-11x+24$
14. $6x^2-19x-7$
15. $4x^2+23x-6$
16. $5x^2-28x-12$
17. $x^2-2x-80$
18. $x^2+7x+10$

- Add, subtract, multiply, or divide the rational expressions as indicated, and write your answers in lowest terms.

1. $\dfrac{4a^3}{21}\cdot\dfrac{3}{2a^2}$
2. $\dfrac{5}{15}\cdot\dfrac{x}{2}$
3. $\dfrac{5a^2}{3}\cdot\dfrac{7}{3a^2}$
4. $\dfrac{2p+7}{(p+2)(p-5)}-\dfrac{p+5}{(p+2)(p-5)}$
5. $\dfrac{4x^2}{36}\cdot\dfrac{10}{2x^3}$
6. $\dfrac{6z^3}{7}\cdot\dfrac{2z}{3}$
7. $\dfrac{3}{x^2-3x-10}+\dfrac{7}{x^2-x-20}$
8. $\dfrac{12b^3}{36}\cdot\dfrac{6}{4b^5}$
9. $\dfrac{4}{6k}+\dfrac{18}{6k}$
10. $\dfrac{4}{x-1}+\dfrac{5}{3(x-1)}$
11. $\dfrac{3}{3(m+2)}+\dfrac{2}{4(m+2)}$
12. $\dfrac{3}{5x}-\dfrac{2}{6x}$
13. $\dfrac{8x}{10}\div\dfrac{16x^2}{40u}$
14. $\dfrac{y^2-y-6}{y^2-2y-8}\div\dfrac{y^2-9}{y^2+7y+12}$
15. $\dfrac{b^2+12b+36}{b^2+10b+25}\cdot\dfrac{b^2+6b+9}{b^2-11b+18}$
16. $\dfrac{4b^2}{24}\cdot\dfrac{6}{2b^3}$
17. $\dfrac{6x}{18}\div\dfrac{12x^2}{9y}$

- Simplify each expression by writing your answer in lowest terms with only positive exponents.

1. $\dfrac{x^{-3}x^7}{x^5}$
2. $\left(\dfrac{5}{6}\right)^{-3}$
3. 5^{-3}
4. $\left(\dfrac{5}{x^3}\right)^{-2}$
5. $\dfrac{x^{10} \cdot x^{12}}{x^{24}}$
6. $\dfrac{w^{12}}{w^4 \cdot w^{10}}$
7. $v^8(v^4 + v^6)$
8. $\dfrac{p^{12} \cdot p^6}{p^{10}}$
9. $\dfrac{x^6 \cdot x^5}{x^{10}}$

- Simplify each radical expression.

1. $\sqrt{49} \cdot \sqrt{9}$
2. $\sqrt[3]{343}$
3. $\sqrt{69 - 5}$
4. $\sqrt[4]{16}$
5. $\sqrt[3]{216}$
6. $\sqrt{252}$
7. $\sqrt{75} + \sqrt{192}$

- Solve each equation.

1. $6z + 5 = 59$
2. $5m + 10 = 30$
3. $5x + 4 = 19$
4. $3x + 4 = 22$
5. $12x + 3 = 27$
6. $6 + 7x = 55$
7. $4x + 16 = 20$
8. $5x = 6 + 2x$
9. $5x + 5 = 20$
10. $25x + 30 = 50$
11. $5r + 15 = 240$
12. $5x + 6(4x - 17) = 14$
13. $2(x + 5) - 7 = 3(x - 2)$
14. $2x + 30 = 56$
15. $\dfrac{3}{x} - \dfrac{3}{4x} = \dfrac{21}{8}$
16. $|9y + 4| = 40$
17. $|8x + 4| = 20$
18. $\left|\dfrac{3}{r + 3}\right| = 12$
19. $|2p - 2| = 6$
20. $|m - 4| = 12$
21. $|4x + 7| = 35$
22. $|k - 9| = 4$
23. $|3x - 6| = 12$
24. $|4x - 2| = 10$
25. $|-2x + 7| = 25$
26. $|9 - 2x| = 3$
27. $|10 + 5x| = 50$

- Solve each inequality.

1. $4 - 2a \leq 36$
2. $6x - 7 \leq 4 - 2x$
3. $-7a \leq 21$
4. $3x + 2 \leq 8$

5. $-3x + 5 \leq -16$
6. $-3(4y - 8) \leq 5(2y - 4)$
7. $4(x + 2) \geq -2$
8. $10x + 5 < 12 - 18x$
9. $-4b \leq 16$
10. $3(x + 3) \leq 5(x - 1)$
11. $3x + 6 \leq 18$
12. $-10x \geq 30$
13. $4k + 3 < 10$
14. $4x - 12 < 48$
15. $|x| \leq 2$
16. $|3 + x| < 7$
17. $|5x - 3| \geq 13$
18. $|12t + 9| - 64 < 1$
19. $|3x + 4| < 5$
20. $|x + 2| \leq 4$
21. $|6x + 4| \geq 8$
22. $2 \cdot |4x + 2| < 12$
23. $|s| \leq 10$
24. $|7a + 5| < 21$
25. $\left|x - \frac{2}{3}\right| > 4$
26. $|4x + 6| \leq 18$
27. $|x| > 5$
28. $|5x + 3| \geq 11$
29. $|x + 5| > 15$

- Find the x-intercepts and y-intercepts of the graph of each equation.

1. $5x + 10y = 50$
2. $3x + 5y = 15$
3. $10x - 4y = 20$
4. $2x + 6y = 18$
5. $5x + 4y = 20$
6. $5x + 3y = 30$
7. $y = 5x - 2$
8. $y = -2x + 4$
9. $6x + 2y = 12$
10. $9x + 4y = 18$
11. $x - 2y = 1$

- Find an equation of the line satisfying the given conditions.

1. Find an equation of the line that passes through $(5, 10)$ and $(-3, 6)$.
2. Find an equation of the line that passes through $(5, 7)$ and $(8, -10)$.
3. Find an equation of the line that passes through $(3, 4)$ and $(5, 1)$.
4. Find an equation of the line that passes through $(2, 4)$ and $(5, 5)$.
5. Find an equation of the line that passes through $(3, 5)$ and $(0, 2)$.
6. Find an equation of the line with slope $m = 6$ that passes through the point $(12, 6)$.
7. Find an equation of the line with slope $m = 4$ that passes through the point $(4, 3)$.
8. Find an equation of the line with undefined slope that passes through the point $(4, 3)$.
9. Find an equation of the line with slope $m = -4$ that passes through the point $(12, 3)$.
10. Find an equation of the line with slope $m = 2$ that passes through the point $(3, 6)$.
11. Find an equation of the line with undefined slope that passes through the point $(3, 4)$.
12. Find an equation of the line with slope $m = 0$ that passes through the point $(2, 5)$.
13. Find an equation of the line with slope $m = \frac{1}{3}$ that passes through the point $(6, 4)$.
14. Find an equation of the line that passes through the point $(2, -4)$ and is parallel to $3x + 2y = 6$.

15. Find an equation of the line that passes through the point $(0, 3)$ and is perpendicular to $2x + y = 6$.

- In each of the following problems, two linear models are given for the data. For each model, complete the table to find the residuals, the squares of the residuals, and their sum. Then decide which model is the better fit.

1. Consider the following data on the number of deaths per 100,000 people from heart disease in selected years:

Year	1990	1995	2000	2005	2010
Deaths	321.8	293.4	257.6	211.1	178.5

We consider the following two models, where x is the number of years since 1990, so that $x = 0$ corresponds to the year 1990:
Model 1: $y = -7.66x + 331.7$
Model 2: $y = -9.3x + 350.6$
Fill in each table:

$y = -7.66x + 331.7$

Data (x, y)	Model $(x, \hat{y})$	Residual $y - \hat{y}$	Squared Residual $(y - \hat{y})^2$
$(0, 321.8)$	$(0, 331.7)$		
$(5, 293.4)$	$(5, 293.4)$		
$(10, 257.6)$	$(10, 255.1)$		
$(15, 211.1)$	$(15, 216.8)$		
$(20, 178.5)$	$(20, 178.5)$		
		Total:	

$y = -9.3x + 350.6$

Data (x, y)	Model $(x, \hat{y})$	Residual $y - \hat{y}$	Squared Residual $(y - \hat{y})^2$
$(0, 321.8)$	$(0, 350.6)$		
$(5, 293.4)$	$(5, 304.1)$		
$(10, 257.6)$	$(10, 257.6)$		
$(15, 211.1)$	$(15, 211.1)$		
$(20, 178.5)$	$(20, 164.6)$		
		Total:	

Which model fits the data better?

2. Consider the following data on the number of basic cable television subscribers (in millions):

Year	2002	2004	2006	2008	2010
Subscribers	66.5	65.7	65.3	64.3	61.0

We consider the following two models, where x is the number of years since 2000, so that $x = 2$ corresponds to the year 2002:
Model 1: $y = -0.5x + 68.3$
Model 2: $y = -0.3x + 67.1$

Fill in each table:

$y = -0.5x + 68.3$

Data (x, y)	Model $(x, \hat{y})$	Residual $y - \hat{y}$	Squared Residual $(y - \hat{y})^2$
$(2, 66.5)$	$(2, 67.3)$		
$(4, 65.7)$	$(4, 66.3)$		
$(6, 65.3)$	$(6, 65.3)$		
$(8, 64.3)$	$(8, 64.3)$		
$(10, 61.0)$	$(10, 63.3)$		
		Total:	

$y = -0.3x + 67.1$

Data (x, y)	Model $(x, \hat{y})$	Residual $y - \hat{y}$	Squared Residual $(y - \hat{y})^2$
$(2, 66.5)$	$(2, 66.5)$		
$(4, 65.7)$	$(4, 65.9)$		
$(6, 65.3)$	$(6, 65.3)$		
$(8, 64.3)$	$(8, 64.7)$		
$(10, 61.0)$	$(10, 64.1)$		
		Total:	

Which model fits the data better?

- Find all real solutions to each equation.

1. $(x+5)(x-7)=0$
2. $(x-2)(4x+8)=0$
3. $(x+7)(x-14)=0$
4. $(x-8)(4x+12)=0$
5. $2x^2-8x-24=0$
6. $4x^2-25=0$
7. $x^2+2x-3=0$
8. $x^2+4x=96$
9. $x^2-5x+6=0$
10. $x^2=3x+4$
11. $16x^2-81=0$
12. $r^2-16=0$
13. $8x^2+4x+10=0$

- Solve each inequality.

1. $x^2+x\leq 3$
2. $\dfrac{2x+10}{x+3}\geq 1$
3. $x^3-16x\geq 0$
4. $(x+7)(6x-12)\leq 0$
5. $x^2+9x>-14$
6. $(x-5)(x+4)\leq 0$
7. $x^2+11x+18\geq 0$
8. $x^2-24x>0$
9. $x^2-3x\geq -2$
10. $x^2-x-6<0$
11. $x^2+x-20\leq 0$
12. $x^2+2x-8\geq 0$

- Find the domain of each function.

1. $f(x)=5x-1$
2. $f(x)=8x-2$
3. $f(x)=x+4$
4. $f(x)=\dfrac{1}{x-6}$
5. $f(x)=\sqrt{5-x}$
6. $f(x)=\dfrac{\sqrt{x+4}}{x^2+x-12}$

- Evaluate each given function at the given values.

1. Let $f(x)=x^5$. FInd $f(0)$, $f(-1)$, and $f(2)$.
2. Let $f(x)=4x^2+2x$. Find $f(1)$, $f(2)$, and $f(-3)$.
3. Let $f(x)=x^2+4x$. Find $f(3)$ and $f(4)$.
4. Let $f(x)=\sqrt{x+2}$. Find $f(7)$, $f(5)$, and $f(-11)$.
5. Let $f(x)=|7x-9|$. Find $f(3)$, $f(-2.5)$, and $f(4.6)$.
6. Let $g(x)=2x^2-4x+6$. Find $g(4)$.

- Sketch the graph of each function by plotting a few points.

1. $f(x)=2x+4$
2. $f(x)=|3x-5|$
3. $f(x)=6x+8$
4. $f(x)=6-2x^2$
5. $f(x)=|x+2|+1$
6. $f(x)=\begin{cases} 2x+3 & \text{if } x<0 \\ 3-x & \text{if } x\geq 0 \end{cases}$
7. $f(x)=4-2x^2$
8. $f(x)=\begin{cases} x+2 & \text{if } x<3 \\ -3x-2 & \text{if } x\geq 3 \end{cases}$

9. $f(x) = 3(x-2)^2 + 3$

10. $f(x) = \begin{cases} 5 + x^2 & \text{if } x < 0 \\ 1 & \text{if } x = 0 \\ 2x & \text{if } x > 0 \end{cases}$

- Find the x-intercepts and y-intercepts of each function.

1. $f(x) = x^2 - 16$
2. $f(x) = 2x^2 + 8x + 6$
3. $f(x) = x^2 - 5x + 3$
4. $f(x) = x^2 - 9$
5. $f(x) = 3x^2 + 12x + 9$

- Find the rule of a quadratic function that has the given vertex and passes through the given point.

1. Vertex = (9, 12), passes through (6,3)
2. Vertex = (5, 2), passes through (4,4)
3. Vertex = (1, 2), passes through (5,8)
4. Vertex = (2, -3), passes through (4,2)
5. Vertex = (1, -2), passes through (4,5)
6. Vertex = (12, 8), passes through (18,7)

- Find the vertex of each quadratic function.

1. $g(x) = x^2 - 9x + 18$
2. $f(x) = 3x^2 - 12x + 5$

- Give a sketch of each polynomial function by determining the basic shape, finding the x-intercepts, and determining the behavior of the graph between the x-intercepts.

1. $f(x) = (x+3)(x+4)(x-2)$
2. $f(x) = (2x+4)(x-2)(x-1)$
3. $f(x) = (x+1)(x-5)(x-2)$
4. $f(x) = (x+2)(x-1)^2(x-4)$
5. $f(x) = (x+4)(x-2)(x-3)$
6. $f(x) = x^2(x+4)(x+1)$
7. $f(x) = x^4 - 4x^2$
8. $f(x) = (3x-2)(x+2)^2$
9. $f(x) = (x-7)(x+4)(x+8)$
10. $f(x) = (3x+4)(x-2)(x+3)$

- For each function, find the specified values of the function.

1. Let $f(x) = 3^x$. Find $f(0)$ and $f(1)$.
2. Let $f(x) = 2^x$. Find $f(0)$ and $f(1)$.
3. Let $f(x) = 4^x$. Find $f(2)$ and $f(-1)$.
4. Let $f(x) = 3^{-x}$. Find $f(2)$ and $f(4)$.
5. Let $f(x) = 7^x$. Find $f(0)$ and $f(1)$.
6. Let $g(x) = (.5)^x$. Find $g(0)$ and $g(1)$.
7. Let $f(x) = 8^x$. Find $f(1)$ and $f(-2)$.
8. Let $f(x) = 5^x$. Find $f(0)$ and $f(1)$.
9. Let $f(x) = (2.5)^x$. Find $f(0)$ and $f(1)$.
10. Let $f(x) = (.3)^x$. Find $f(0)$ and $f(1)$.
11. Let $f(x) = 3^{.5x}$. Find $f(0)$ and $f(1)$.
12. Let $f(x) = 16^{x/2}$. Find $f(0)$ and $f(1)$.

- Translate each logarithmic statement into an equivalent exponential statement.

1. $\log(100) = 2$
2. $\log_6(216) = 3$
3. $\log_5(25) = 2$
4. $\log(100000) = 5$
5. $\log(100) = 2$
6. $\log_2(8) = 3$
7. $\log_6(1296) = 4$
8. $\log(10000) = 4$
9. $\log_2(\frac{1}{16}) = -4$
10. $\log_4(64) = 3$

- Evaluate each expression.

1. $\log_7(49)$
2. $\log_5(\frac{1}{25})$
3. $\log_8(\frac{1}{2})$
4. $\log(.001)$
5. $\ln(\sqrt{e})$
6. $\log_7(7^{3.84})$

- Solve each equation. You may round answers to 3 decimal places.

1. $\ln(x+5) = \ln(2x-15)$
2. $e^{-2x} = 10$
3. $\ln(2x+6) = \ln(x+12)$
4. $4^{x+2} = 16$
5. $\log_7(70x-7) = 3$
6. $4^{3x-8} = 64$
7. $\ln(x+2) = \ln(2x-3)$
8. $5^{x-1} = 25$
9. $\log_3(5x-1) = \log_3(x+7)$
10. $10^{1-x} = 10^4$
11. $\log_4(6x-2) = 3$
12. $25^x = 625$
13. $\ln(2x+5) = 1 + \ln(x-2)$
14. $4^{-2x} = 10^{x-1}$
15. $\ln(x-7) = \ln(5x+11)$
16. $7^x = 5$
17. $\ln(6x+3) = \ln(3) + \ln(x+4)$
18. $4^x = 9$
19. $\log_2(3x-1) = 2$
20. $\left(\frac{2}{3}\right)^x = \frac{9}{4}$
21. $\ln(x+4) = \ln(3x+1)$
22. $3^{x+5} = 17$
23. $\log_8(x+4) = 2 - \log_8(2x)$
24. $12^{x-2} = 144$
25. $\ln(8x+2) = \ln(3x-5)$
26. $9^{2-x} = 81^{x+4}$

- Write each expression with a rational exponent as a radical expression.

1. $x^{1/2}$
2. $x^{1/4}$
3. $x^{2/3}$
4. $x^{-4/3}$
5. $x^{5/2}$
6. $x^{-1/3}$

- Match each radical expression in the left column to the equivalent expression with rational exponents in the right column.

1. $\dfrac{3}{\sqrt[3]{x}}$	(a) $(-3x)^{1/3}$
2. $\sqrt[3]{3x}$	(b) $(-3x)^{-1/3}$
3. $3\sqrt[3]{x}$	(c) $3x^{1/3}$
4. $\dfrac{1}{\sqrt[3]{3x}}$	(d) $(3x)^{1/3}$
5. $\dfrac{-3}{\sqrt[3]{x}}$	(e) $-3x^{-1/3}$
6. $\sqrt[3]{-3x}$	(f) $-3x^{1/3}$
7. $\dfrac{1}{\sqrt[3]{-3x}}$	(g) $(3x)^{-1/3}$
8. $-3\sqrt[3]{x}$	(h) $3x^{-1/3}$

- Solve each system of equations.

1.
$$\begin{aligned} x + 2y &= 6 \\ 4x - 3y &= 3 \end{aligned}$$

2.
$$\begin{aligned} 3x + y + z &= 9 \\ 7y - 11z &= -51 \\ -34z &= -156 \end{aligned}$$

3.
$$\begin{aligned} 2x + y &= 6 \\ x + 3y &= 9 \end{aligned}$$

4.
$$\begin{aligned} 8x + 7y + z &= 15 \\ 4y - 3z &= 6.5 \\ 2z &= 1 \end{aligned}$$

5.
$$\begin{aligned} 2x + 3y &= 15 \\ x - 3y &= 3 \end{aligned}$$

6.
$$\begin{aligned} 2x - y + z &= 3 \\ 5x + 2y - 3z &= 1 \\ 2x + y - z &= 2 \end{aligned}$$

7.
$$\begin{aligned} 2x - 11y &= 8 \\ 4x + y &= 16 \end{aligned}$$

8.
$$\begin{aligned} x + 5y + 5z &= 5 \\ 2x - y + 2z &= 4 \\ -x - 2y - 4z &= 6 \end{aligned}$$

9.
$$\begin{aligned} 3x - 2y &= 12 \\ x + 3y &= 16 \end{aligned}$$

10.
$$\begin{aligned} 3x + 5y - z &= 11 \\ x - 3y + z &= -3 \\ 5x + y - 2z &= 5 \end{aligned}$$

11.
$$\begin{aligned} 2x - 4y &= 9 \\ x - y &= 3 \end{aligned}$$

12.
$$\begin{aligned} 3x + 4y - 2z &= 4 \\ -x + 2y + 3z &= 8 \\ 6x + 10y + 6z &= 7 \end{aligned}$$

13.
$$\begin{aligned} 5x - 3y &= 16 \\ -2x - 4y &= 4 \end{aligned}$$

14.
$$\begin{aligned} x + y + 2z &= 8 \\ -x + 2y + 3z &= 1 \\ 3x - 7y - 10z &= 10 \end{aligned}$$

15.
$$2x + 4y = 8$$
$$3x - 6y = 12$$

16.
$$x + 2y + z = 4$$
$$2x + y + z = 6$$
$$4x + 6y + 2z = 8$$

17.
$$x + y = 7$$
$$x + 2y = 11$$

18.
$$4x + 2y - 2z = 10$$
$$2x + 8y + 4z = 32$$
$$30x + 12y - 4z = 24$$

19.
$$3x + y = 7$$
$$x + 2y = 4$$

20.
$$2x + 3y + 4z = 12$$
$$x + 4y + 6z = 9$$
$$x - 2y + 4z = 12$$

21.
$$5x - 2y = 1$$
$$x - 6y = 3$$

22.
$$2x + 7y + z = 2$$
$$4x + 7y + 2z = 1$$
$$2x + 7y + 3z = 4$$

23.
$$2x - 3y = 12$$
$$-4x + 6y = 15$$

- Answer each of the following problems.

1. Susie needs to rent a car. The Renta car company rents cars with a cost of \$12 per day plus a \$30 insurance fee. First, find an expression for the total cost of renting the car for x days. Then, if Susie needed the car for 10 days, find the total cost that she would have to pay.

2. A company sells t-shirts for \$12.75 per shirt. Their fixed costs of manufacturing are \$136,000. The variable cost of printing, packaging, and distribution of x shirts is given by $-2x^2 + 3150x - 200$. Find expressions for the revenue, cost, and profit from selling x amount of shirts.

3. World Market is selling their new limited time only candle this month for \$11.25 per candle. The variable costs of producing x thousand candles is $-5x^2+4450x-270$ dollars. The fixed costs of manufacturing are \$305,000. Find expressions for the revenue, cost, and profit from selling x thousand items.

4. It is found that at Little General, the distance you can travel on x dollars worth of gas is given by $y = 8x$, where y is the total distance in miles. How much will it cost to get enough gas to travel 120 miles?

5. Tommy can only tell temperatures in Kelvin. The relationship between temperature in Kelvin and temperature in degrees Fahrenheit is given by $F = \frac{9}{5}(K - 273) + 32$, where F is the temperature in degrees Fahrenheit and K is the temperature in Kelvin. If the thermostat reading says 59 degrees Fahrenheit, what is the temperature in Kelvin?

6. A fundraiser is selling t-shirts. The profit in dollars is modeled by the function

$$P(x) = \begin{cases} x + 7 & \text{if } 0 \leq x < 50 \\ x + 9 & \text{if } 50 \leq x < 100 \\ x + 12 & \text{if } x \geq 100 \end{cases}$$

where x is the number of t-shirts sold. Find the profits from selling 23 t-shirts, 74 t-shirts, and 109 t-shirts.

7. The total cost in dollars of producing x DVDs is $C(x) = 6.80x + 450,000$. What are the fixed costs? What is the marginal cost per DVD?

8. The owners of a parking lot have determined that their weekly revenue and cost in dollars are given by $R(x) = 80x$ and $C(x) = 50x + 2400$, where x is the number of long-term parkers. Find the break-even point.

9. Suppose the supply curve for radial tires in dollars is given by $p = \frac{2}{5}q$ and the demand curve is given by $p = 100 - \frac{2}{5}q$. Find the equilibrium quantity and price.

10. Suppose you deposit \$700 in a savings account with an interest rate of 3% compounded quarterly. How much is in the account after 2 years, after 7 years, and after 16 years?

11. In assembly line operations, it is found that a worker who is new to the job will produce $P(t)$ items on day t, where $P(t) = 50 - 50e^{-.5t}$. How many items will be produced on the first day? How many items will be produced on the fifth day? According to the function, what is the maximum number of items the worker can produce?

12. Suppose you owe \$3500 on a credit card. To pay it off, you don't make any new purchases on it and each month you make a payment that is slightly more than the monthly interest, so that the remaining balance on the card after t months is given by $B(t) = 3500(.9898)^t$. What is the balance after 3 months? What is the balance after 6 years? What is the balance after 11 years?

13. You place \$10,000 into an account that compounds interest continuously at an annual interest rate of 5%. How long will it take until the account has \$20,000?

14. A \$1000 investment is made with an annual interest rate of 12% compounded monthly. How long until you reach \$2000?

15. A party store has a total of 300 balloons for sale. Large balloons are sold for \$5 and small balloons are sold for \$3. The total revenue from selling all the balloons is \$1220. How many large and small balloons were sold?