Elementary Algebra
~~Final Examination~~
~~XXXXXXXXXX~~
SAMPLE Final Exam

NAME: _____
~~Spring 2018~~
~~XXXXXXXX~~
Fall 2018

You will have 2 hours to complete this exam. You may use a calculator but must show all algebraic work in the space provided to receive full credit. Read all directions carefully, simplify all answers fully, and clearly indicate your answer. Good Luck!

Solve each equation. Show all algebraic work for full credit. *(3 points each)*

1) $6 + x = 2$

$-6 \quad -6$

$x = -4$

1) $x = -4$

2) $\frac{4}{3} \cdot \frac{9}{1} = \frac{3}{4}x \cdot \frac{4}{3}$

$\frac{36}{3} = x$

$12 = x$

2) $x = 12$

3) $3 - 2x = 6 + 7x$

$-7x \quad -7x$

$3 - 9x = 6$

$-3 \quad -3$

$-9x = 3$

$\frac{-9x}{-9} = \frac{3}{-9}$

$x = -\frac{3}{9} = -\frac{1}{3}$

3) $x = -\frac{1}{3}$

Solve each equation. Show all algebraic work for full credit. *(3 points each)*

4) $3(2x + 6) = 18$

4) $x = 0$

$6x + 18 = 18$

$-18 \quad -18$

$\frac{6x}{6} = \frac{0}{6}$

$x = 0$

5) $\frac{10}{1} \cdot \frac{2}{5}x + \frac{3}{10} \cdot \frac{10}{1} = \frac{1}{2} \cdot \frac{10}{1}$

5) $x = \frac{1}{2}$

$4x + 3 = 5$

$-3 \quad -3$

$\frac{4x}{4} = \frac{2}{4}$

$x = \frac{2}{4} = \frac{1}{2}$

6) $8x - (4x - 3) = 4x + 7$

6) No Solution

$8x - 4x + 3 = 4x + 7$

$4x + 3 = 4x + 7$

$-4x \qquad -4x$

$3 = 7$ False

No Solution

Solve the equation. Show all algebraic work for full credit. *(3 points)*

7) $3(2y+1) = -3(3y+4)$

7) $y = -1$

$6y + 3 = -9y - 12$

$+9y \quad +9y$

$15y + 3 = -12$

$-3 \quad -3$

$\frac{15y}{15} = \frac{-15}{15}$

$y = -1$

$y = -1$

Solve each inequality and graph the solution on the number line provided. *(3 points each)*

8) $-7x - 3 \leq 11$

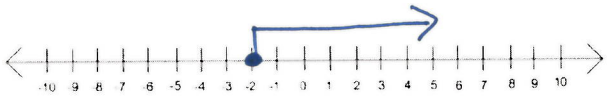
8) $x \geq -2$

$+3 \quad +3$

$-7x \leq 14$

$\frac{-7x}{-7} \leq \frac{14}{-7}$

$x \geq -2$



9) $0.1x + 2 < -0.4x + 1$

9) $x < -2$

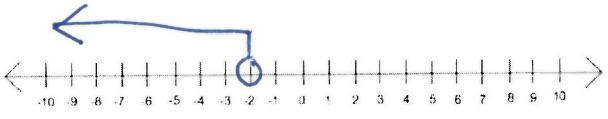
$+.4x \quad +.4x$

$0.5x + 2 < 1$

$-2 \quad -2$

$\frac{0.5x}{0.5} < \frac{-1}{0.5}$

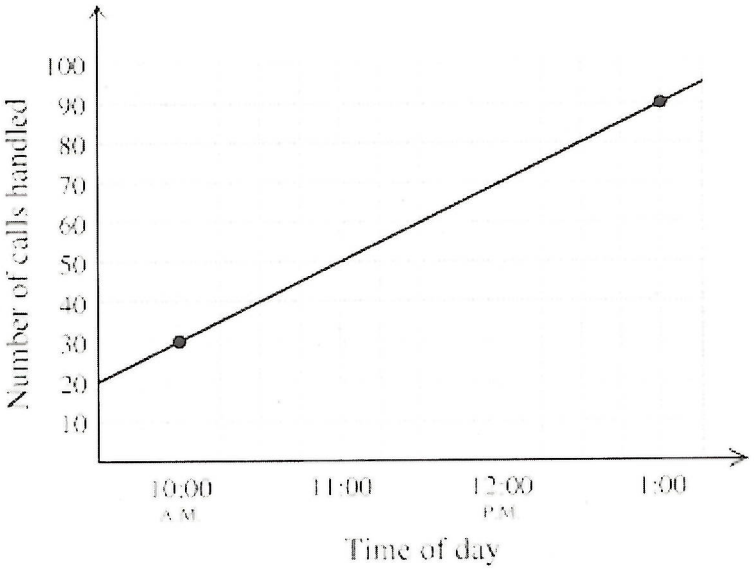
$x < -2$



10) Write the equation of a line that has a slope of $\frac{7}{2}$ and intersects the y-axis at (0, -4). *(2 points)*

$y = \frac{7}{2}x - 4$

11) Write the equation of the line for the graph shown. *(2 points)*



$y = 20x + 20$

12) Find the slope of each line. Then state whether the two lines are parallel, perpendicular or neither. Show your work and justify your answer for full credit. *(3 points)*

$y = -3x + 1$

Slope of first line -3

$\frac{6y}{6} = \frac{2x}{6} - \frac{8}{6}$

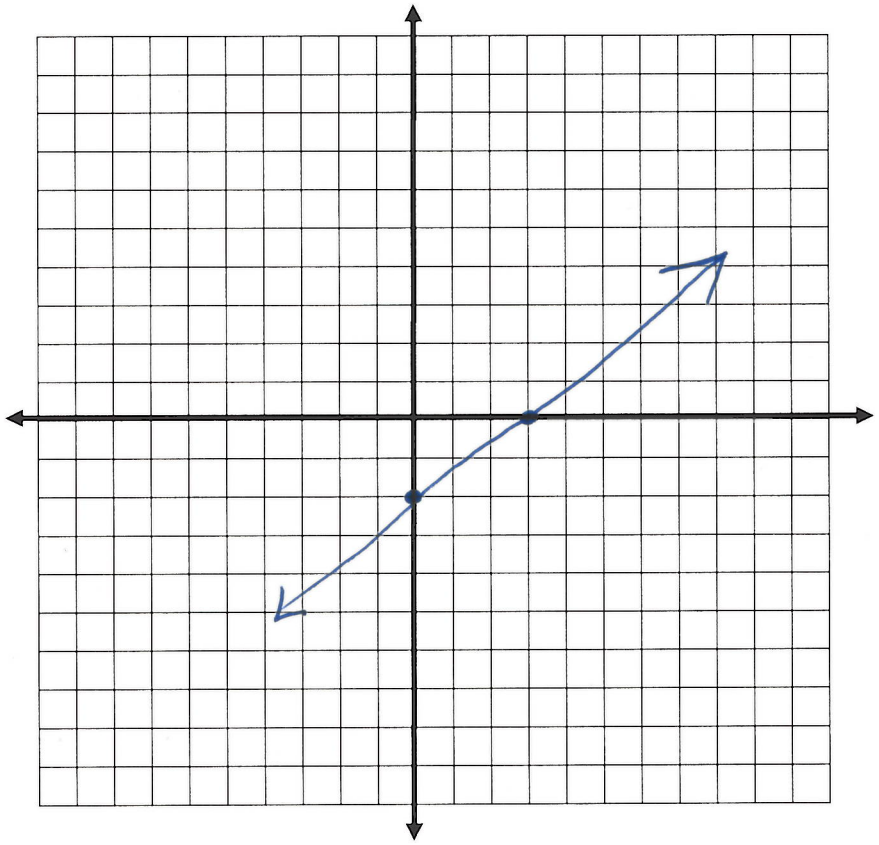
$y = \frac{1}{3}x - \frac{4}{3}$

Slope of second line $\frac{1}{3}$

Answer with reason: They are perpendicular. Their slopes are opposite reciprocals

13) Given the line $2x - 3y = 6$, find the following. *(1 point each)*

x	y
0	-2
3	0



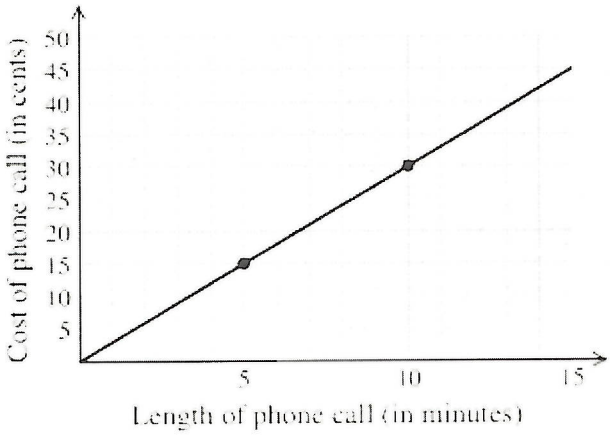
a) x-intercept: (3,0)

b) y-intercept: (0,-2)

c) slope: 2/3

d) Graph.

14) The graph below shows data for a recent phone call between the U.S. and the Netherlands. Use the graph to find the rate at which the customer was being billed. Include the proper units in your answer. *(2 points)*



$\frac{15 \text{ cents}}{5 \text{ min}} = 3 \frac{\text{cents}}{\text{min}}$

14) 3 cents/min

15) Al's plumbing charges \$50 to make a house call and then \$75 for each additional hour they spend at your house.

a) How much would they charge if they spent 2 hours at your house? \$200 *(1 point)*

$50 + 75(2)$

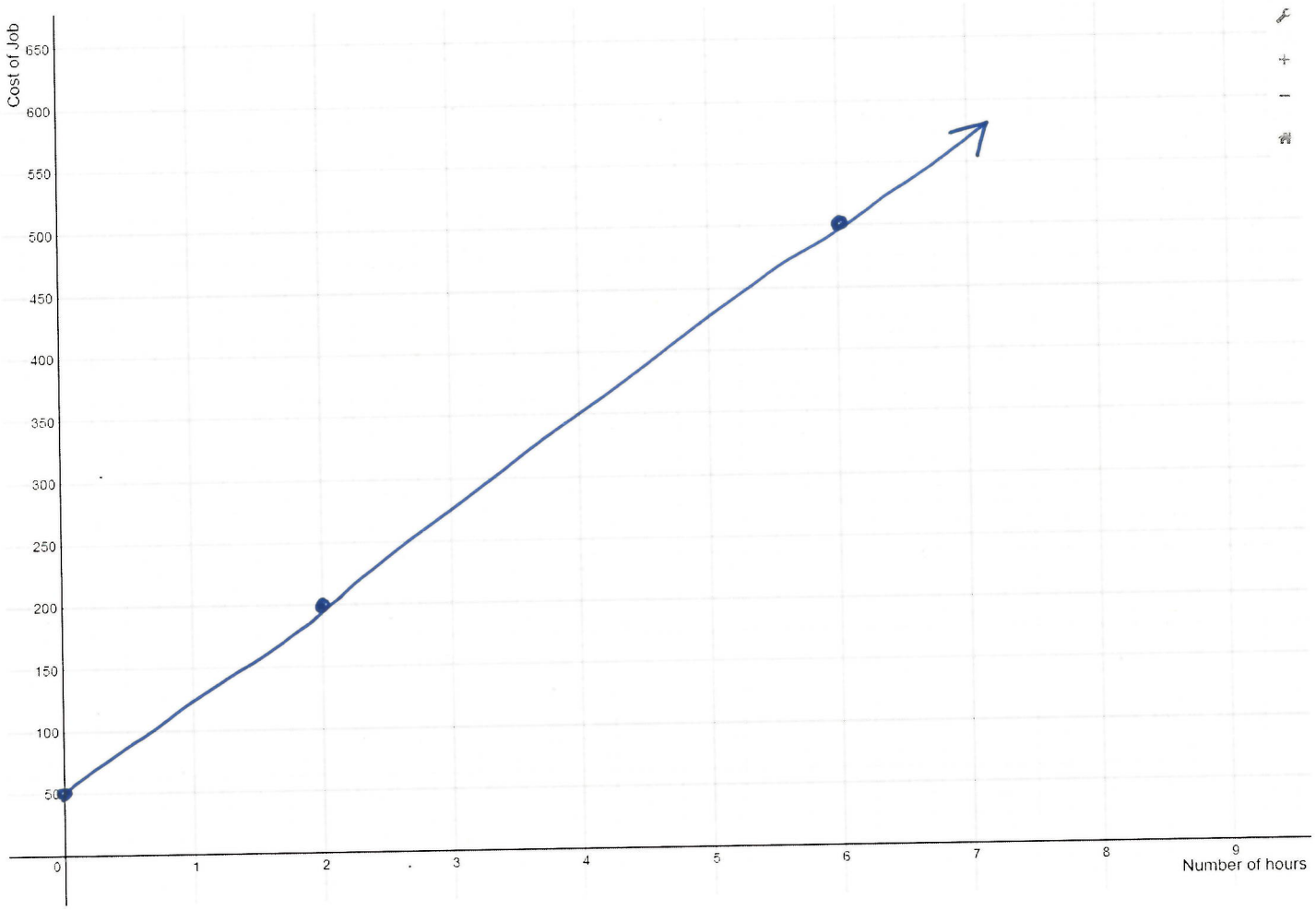
b) How much would they charge if they spent 6 hours at your house? \$500 *(1 point)*

$50 + 75(6)$

c) Write an equation that models this situation.
Let $y =$ *the cost* and let $x =$ *the number of hours on job.*

Equation: $y = 75x + 50$ *(2 points)*

d) Graph. *(2 points)*



16) If $f(x) = x^2 - 4x + 6$, then find $f(0)$ and $f(-2)$. *(1 point each)*

a) $f(0) =$

16a) 6

$0^2 - 4(0) + 6 = 6$

b) $f(-2) =$

16b) 18

$(-2)^2 - 4(-2) + 6$

$4 + 8 + 6 = 18$

17) Solve the system of equations. *(3 points)*

$y = 2x + 10$

$3x + 5y = 11$

$3x + 5(2x + 10) = 11$

$3x + 10x + 50 = 11$

$13x + 50 = 11$

$-50 \quad -50$

$\frac{13x}{13} = \frac{-39}{13}$

$x = -3$

$y = 2(-3) + 10$

$y = -6 + 10 = 4$

(-3, 4)

18) Solve the system of equations. *(3 points)*

$$\begin{matrix} 3x - 2y = 8 \\ 4x - 6y = 14 \end{matrix}$$

$-3($

$-9x + 6y = -24$

$4x - 6y = 14$

$-5x = -10$

$x = 2$

$3(2) - 2y = 8$

$6 - 2y = 8$

$-2y = 2$

$y = -1$

$\boxed{(2, -1)}$

Simplify each expression. Write the result using positive exponents. Please <u>circle</u> your final answer. *(2 points each)*

19) $x^{-6} \cdot x^3 \cdot x$

$x^{-6+3+1} = x^{-2}$

$= \boxed{\frac{1}{x^2}}$

20) $(z^{-1})^{-7}$

$\boxed{z^7}$

21) $(3x^3y)(3x^{-1}y)$

$\boxed{9x^2y^2}$

22) $\frac{3a^4b^6}{12a^5b^3}$

$\frac{1a^{-1}b^3}{4}$

$= \boxed{\frac{b^3}{4a}}$

Perform the indicated operations. Simplify answers fully. *(2 points each)*

23) $6a - 5b + c - 4a + 4b - c$

$2a - b$

24) $(4x^2 + 5x - 3) - (x^2 - 7x + 6)$

$4x^2+5x-3 \quad -x^2+7x-6$

$3x^2+12x-9$

25) $2x(x^2 - x + 1)$

$2x^3-2x^2+2x$

26) $(x + 5)(x - 2)$

$x^2-2x+5x-10$

$x^2+3x-10$

Perform the indicated operations. Simplify answers fully. *(2 points each)*

27) $(3x + 5)(3x - 5)$

$9x^2 - 15x + 15x - 25$

$\boxed{9x^2 - 25}$

28) $(2x - 3)^2$

$(2x-3)(2x-3)$

$4x^2 - 6x - 6x + 9$

$\boxed{4x^2 - 12x + 9}$

29) $\dfrac{10x^4 + 15x^3 - 5x^2}{5x^2}$

$\dfrac{10x^4}{5x^2} + \dfrac{15x^3}{5x^2} - \dfrac{5x^2}{5x^2}$

$\boxed{2x^2 + 3x - 1}$

Scientific Notation.

30) A human hair is about 0.00004 meters in diameter. A strand of DNA is 0.000000002 meters in diameter. How many strands of DNA laid side by side would it take to equal the width of a human hair? *(1 point per part)*

a) Convert 0.00004 into scientific notation.

4×10^{-5}

b) Convert 0.000000002 into scientific notation.

2×10^{-9}

c) Calculate the number of strands of DNA would be needed to equal the width of a human hair by dividing your answers from parts a and b. Leave your answer in scientific notation.

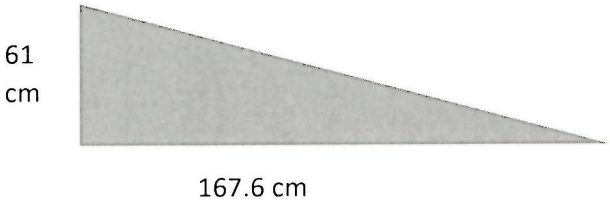
$$\frac{4 \times 10^{-5}}{2 \times 10^{-9}} = 2 \times 10^{4}$$

d) Convert the value found in the previous part back into standard notation.

20,000

Applications. Show your algebraic work for each problem. Include the proper units. Circle your final answer.

31) Josh is building a skateboard ramp that is 167.6 cm long and 61 cm in height. Find the grade of the ramp. Express your answer as a percent rounded to the nearest tenth. *(2 points)*



grade = slope = $\frac{\text{rise}}{\text{run}}$

$= \frac{61}{167.6} \approx .36396$

36.4%

32) The formula $T = -\frac{3}{4}a + 165$ can be used to determine the target heart rate, T, in beats per minute for a person a years old who is participating in aerobic exercise. What is the target heart rate of a 32 year old person who is participating in aerobic exercise? *(2 points)*

$T = -\frac{3}{4}(32) + 165$

$T = -24 + 165$

$T = 141$

141 bpm

***Choose 4 out of the following 5 word problems to complete. Please put a large X through the problem that you do not want graded. <u>You must use algebra to receive credit and you must show all work for each problem</u>.**
(4 points each)

33) After leaving a 20% tip, the cost of your meal at Chili's was $39.20. What was the cost of the meal before tip? Round your answer to the nearest cent.

x = cost before tip

$x + .2x = 39.20$

$\frac{1.2x}{1.2} = \frac{39.20}{1.2}$

$x = 32.67$

$32.67

34) Janelle works at a jewelry store and is paid a base salary of $150 per week plus 20% of her total sales. If Janelle earned $450 last week, what were her total sales?

x = total sales

$150 + .2x = 450$

$-150 \quad -150$

$\frac{.2x}{.2} = \frac{300}{.2}$

$x = 1500$

$1500

35) Mike is buying coffee and donuts for his coworkers. The coffee costs $1.50 per cup and the donuts are $0.75 each. He bought a total of 49 items and spent $59.25. How many coffees and how many donuts did he buy?

c = # of coffees

d = # of donuts

$c + d = 49$

$1.50c + .75d = 59.25$

$1.50(49-d) + .75d = 59.25$

$73.5 - 1.50d + .75d = 59.25$

$73.5 - .75d = 59.25$

$-73.5 \quad -73.5$

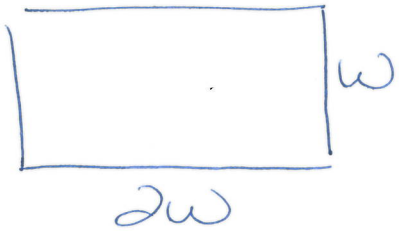
$\frac{-.75d}{-.75} = \frac{-14.25}{-.75}$

$d = 19$

$c = 30$

19 Donuts
30 coffees

36) Sue is planting a garden that is twice as long as it is wide. She figured out that she needed 30 feet of fencing to go around the perimeter of the garden. What are the dimensions of Sue's garden?



$L = 2w$

$2L + 2w = 30$

$2(2w) + 2w = 30$

$4w + 2w = 30$

$6w = 30$

$w = 5$

$L = 10$

width	Length
5ft	10ft

37) Mary is driving to Florida and leaves at 10:00 a.m. traveling at 55 mph. Her daughter Jane leaves 2 hours later and is traveling at 75mph. At what time will Jane overtake her mother assuming they don't stop?

	D	r	t
Mary	D	55	t
Jane	D	75	t-2

$D = 55t$

$D = 75(t-2)$

$55t = 75(t-2)$

$55t = 75t - 150$

$-25t = -150$

$t = 6$

10:00 AM plus 6 hours $\Rightarrow$ 4pm

BONUS: ***(2 points)***

Find two integers that have a sum of 7 and a product of -18

Bonus: 9 and -2