Elementary Algebra
Sample Final Exam

NAME: Answers
Spring 2017

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) $15 = 20 - x$

$-20 \quad -20$

$\frac{-5}{-1} = \frac{-x}{-1}$

$5 = x$

1) $x = 5$

2) $\frac{2}{3}x - 4 = 8$

$+4 \quad +4$

$\frac{3}{2} \cdot \frac{2}{3}x = 12 \cdot \frac{3}{2}$

$x = 18$

2) $x = 18$

3) $-4y - 3 = 2y + 21$

$-2y \quad -2y$

$-6y - 3 = 21$

$+3 \quad +3$

$\frac{-6y}{-6} = \frac{24}{-6}$

$y = -4$

3) $y = -4$

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

4) $-3(4y-2)=78$

$-12y+6=78$
$-6 \quad -6$
$-12y=72$
$\frac{-12y}{-12}=\frac{72}{-12}$
$y=-6$

4) $y=-6$

5) $12\left(\frac{1}{2}x+\frac{3}{4}\right)=\left(\frac{2}{3}x\right)12$

$6x+9=8x$
$-6x \quad -6x$
$\frac{9}{2}=\frac{2x}{2}$
$9/2=x$

5) $x=9/2$

6) $6x-(2x-6)=20-3x$

$6x-2x+6=20-3x$
$4x+6=20-3x$
$+3x \quad +3x$
$7x+6=20$
$-6 \quad -6$
$\frac{7x}{7}=\frac{14}{7}$
$x=2$

6) $x=2$

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

7) $4(y+1) = 5(y-5) - y$

7) No Solution

$4y+4 = 5y-25-y$

$4y+4 = 4y-25$

$-4y \quad -4y$

$4 = -25$ False

$\Rightarrow$ No Solution

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

8) $3x \leq 7x + 16$

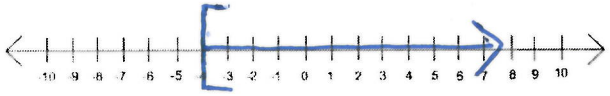
8) $x \geq -4$

$-7x - 7x$

$-4x \leq 16$

$\frac{-4x}{-4} \leq \frac{16}{-4}$

$x \geq -4$



9) $0.4t - 0.32 + 8 < 1.7t + 8 - 1.62t$

9) $t < 1$

$.4t + 7.68 < .08t + 8$

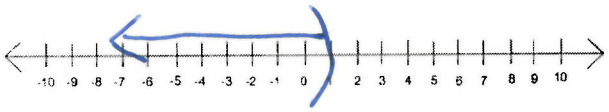
$-.08t \quad -.08t$

$.32t + 7.68 < 8$

$-7.68 \quad -7.68$

$\frac{.32t}{.32} < \frac{.32}{.32}$

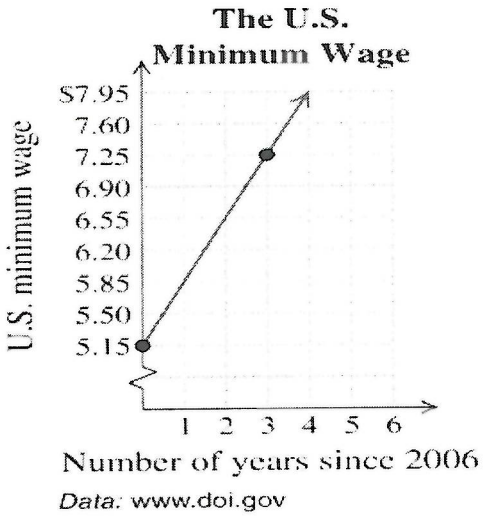
$t < 1$



10) Write the equation of a line that has a slope of $-\frac{2}{3}$ and intersects the y-axis at (0, 5). *(2 points)*

$y = -\frac{2}{3}x + 5$

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



$m = \frac{7.25 - 5.15}{3 - 0} = \frac{2.1}{3} = .7$

$y = .7x + 5.15$

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)*

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

Slope of first line $-1/3$

$3x + 9y = 12$

$-3x \quad -3x$

$\frac{9y}{9} = \frac{-3x}{9} + \frac{12}{9}$

$y = -1/3x + 4/3$

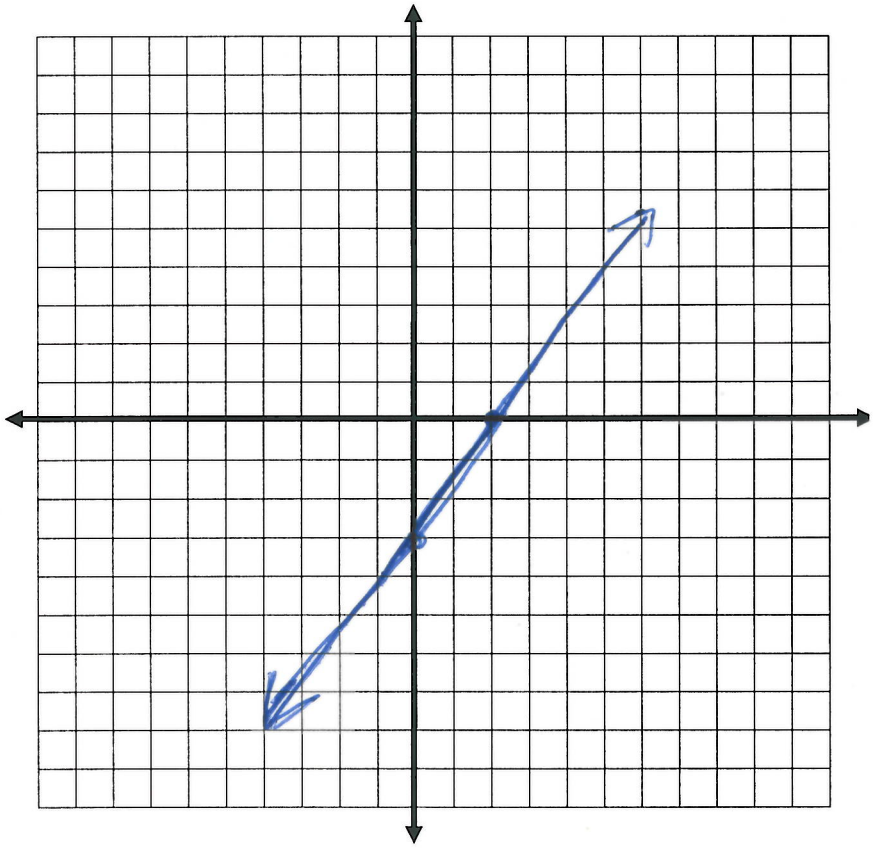
Slope of second line $-1/3$

Answer with reason: Parallel, Because they have the same slope

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

(or $y = \frac{3}{2}x + 3$)

x	y
0	-3
2	0



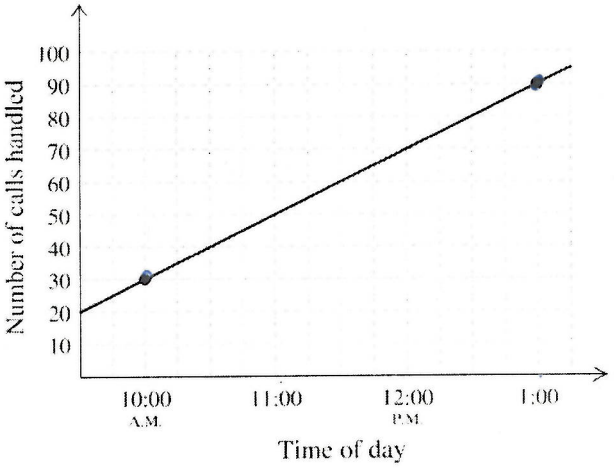
a) x-intercept: (2, 0)

b) y-intercept: (0, -3)

c) slope: $\frac{3}{2}$

d) Graph.

14) The following graph shows data from a technical assistance call center. At what rate are calls being handled. Be sure to include proper units. *(1 point)*



$\frac{90 - 30 \text{ calls}}{3 \text{ hrs}} = \frac{60}{3} = 20$

14) 20 calls/hr

15) The cost to rent a car is \$40 per day plus \$0.20 per mile. If Sue rents a car for a day,

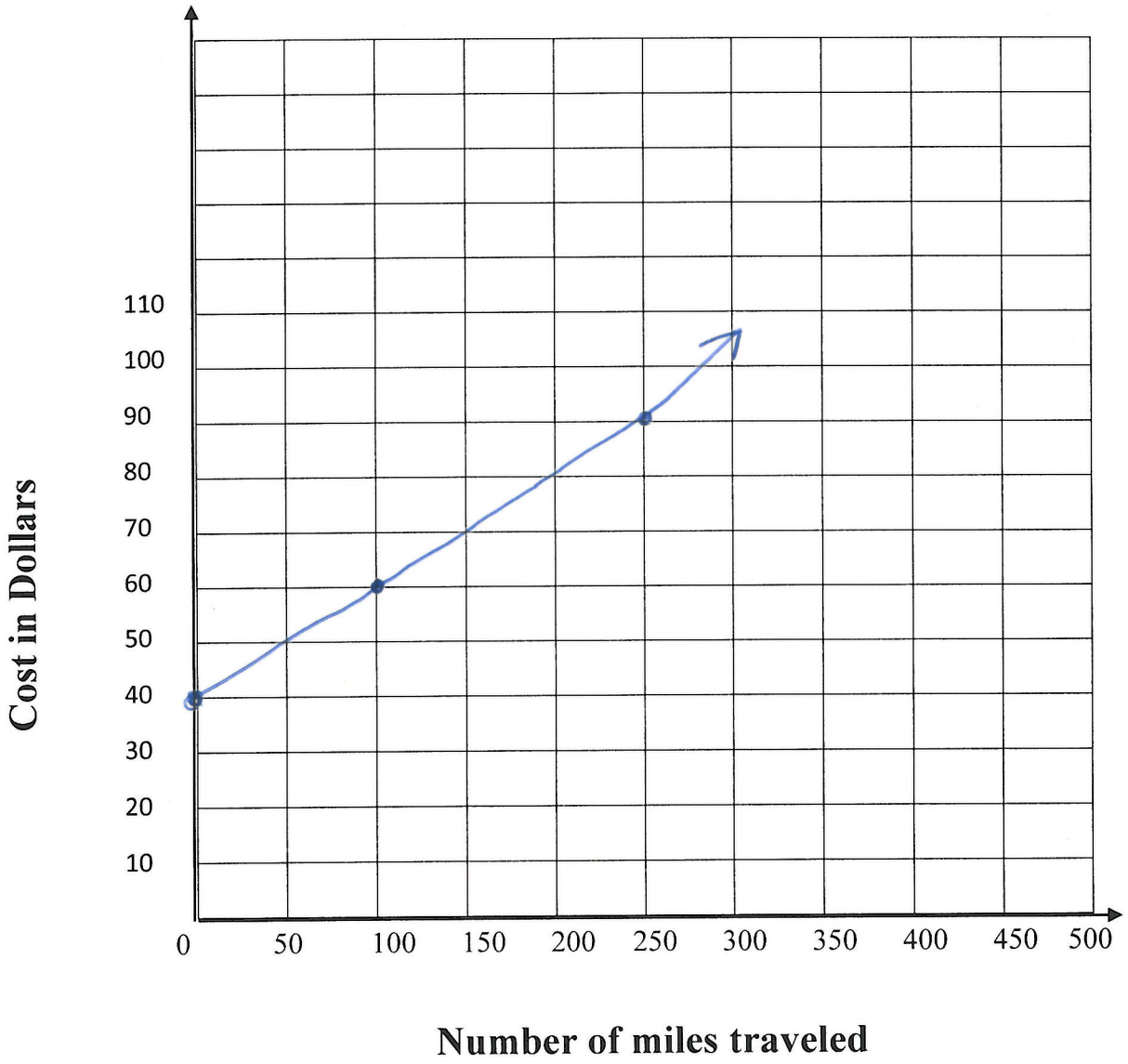
a) What would her cost be to travel 100 miles ? \$60 *(2 point)* $40 + .2(100)$

b) What would her cost be to travel 250 miles? \$90 *(2 point)* $40 + .2(250)$

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

Equation: $y = 40 + .2x$ *(2 points)*

d) Graph. *(2 points)*



16) Write the equation of the line that contains the points (-2,3) and (4, 6). *(3 points)*

$m = \frac{6-3}{4-(-2)} = \frac{3}{6} = \frac{1}{2}$

$y = \frac{1}{2}x + b$

$6 = \frac{1}{2}(4) + b$

$6 = 2 + b$

$-2 \quad -2$

$4 = b$

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

17) If $f(x) = x^2 - 2x - 8$, then find $f(0)$ *and* $f(-2)$. *(1 point each)*

a) $f(0) =$ 17a) -8

$0^2 - 2(0) - 8 = -8$

b) $f(-2) =$ 17b) 0

$(-2)^2 - 2(-2) - 8$

$4 + 4 - 8 = 0$

18) Find the point of intersection of the two lines using the substitution method. (3 points)

$2x - 3y = -5$
$y = x - 1$

$2x - 3(x-1) = -5$

$2x - 3x + 3 = -5$

$-x + 3 = -5$

$-3 \quad -3$

$-x = -8$

$x = 8$

$y = 8 - 1 = 7$

$(8, 7)$

19) Find the point of intersection of the two lines using the elimination (addition) method. *(3 points)*

$2(2x + 3y = -1)$
$3(3x - 2y = 5)$

$4x + 6y = -2$
$9x - 6y = 15$

$13x = 13$

$x = 1$

$(1, -1)$

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

$2 + 3y = -1$

$3y = -3$

$y = -1$

20) Express 350,000,000 in scientific notation. *(1 point)*

3.5×10^8

21) 3.5×10^8

21) Write 5.1×10^{-6} in standard form (decimal notation). *(1 point)*

.000005.1

22) .0000051

22) Multiply. Write your answer in scientific notation. *(2 points)*

$(4 \times 10^8)(2.3 \times 10^{-15})$

$4(2.3) \times 10^{-7}$

9.2×10^{-7}

23) 9.2×10^{-7}

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

23) $x \cdot x^4 \cdot x^{-3}$

x^{1+4-3}

$\boxed{x^2}$

25) $(y^{-5})^{-2}$

$y^{-5 \cdot (-2)} = \boxed{y^{10}}$

26) $(2x^3y^{-2})^3$

$2^3 x^9 y^{-6}$

$\boxed{\frac{8x^9}{y^6}}$

27) $\frac{30a^3b^{15}}{15a^3b^9}$

$2a^0b^6$

$\boxed{2b^6}$

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

28) $12x^3 + 6x - 1 - 3x^3 + x - 1$

$9x^3 + 7x - 2$

29) $(8x^2 - 5x + 2) - (2x^2 - 2x + 8)$

$8x^2 - 5x + 2 \quad -2x^2 + 4x - 8$

$6x^2 - x - 6$

30) $2x(3x^2 - 6x + 4)$

$6x^3 - 12x^2 + 8x$

31) $(x + 4)^2$

$(x+4)(x+4)$

$x^2 + 4x + 4x + 16$

$x^2 + 8x + 16$

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

32) $(2x + 3)(2x - 3)$

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

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

33) $(x + 2y)(3x + 4y)$

$3x^2 + 4xy + 6xy + 8y^2$

$\boxed{3x^2 + 10xy + 8y^2}$

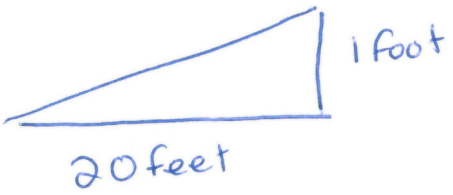
34) $\dfrac{18x^4 - 12x^3 - 3x^2}{3x^2}$

$\dfrac{18x^4}{3x^2} - \dfrac{12x^3}{3x^2} - \dfrac{3x^2}{3x^2}$

$\boxed{6x^2 - 4x - 1}$

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

35) To meet Connecticut Department of Transportation standards, a walkway cannot rise more than 1 foot over a horizontal distance of 20 feet. Express this slope as a grade. Leave your answer as a percent. *(2 points)*



$\frac{1}{20} = .05$

5% grade

36) The formula to convert from Celsius temperature C to Fahrenheit temperature F is given by

$F = \frac{9}{5}C + 32$

If the temperature is 32° Celsius, what is the temperature in degrees Fahrenheit? *(2 points)*

$F = \frac{9}{5}(32) + 32$

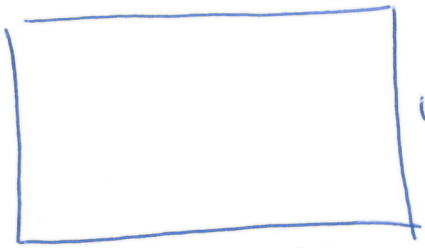
$F = 57.6 + 32$

$F = 89.6$

89.6° F

***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. Show all work for each problem. No credit will be given for answers without algebraic work.**
(3 points each)

37) The perimeter of a rectangular field is 280 feet. If the length is 40 feet longer than the width, find the dimensions of the field.



w = width
w + 40 = length

$2(w+40) + 2w = 280$
$2w + 80 + 2w = 280$
$4w + 80 = 280$
$4w = 200$
$w = 50$

width = 50 feet
length = 90 feet

38) The equation $R = -0.028t + 20.8$ can be used to predict the world record in the 200-m dash, where R is the record, in seconds, and t is the number of years since 1920. In what year will the record be 18 seconds?

$18 = -.028t + 20.8$
$-20.8 \quad -20.8$

$\frac{-2.8}{-.028} = \frac{-.028t}{-.028}$

$100 = t$

$1920 + 100 = 2020$

in year 2020

39) Nick has taken 4 tests in Algebra with grades of 75, 60 ,73, and 81. What is the minimum grade Nick can get on his 5th test to have at least a 70 average in the class?

x = grade on 5th Test

$\left(\frac{75+60+73+81+x}{5}\right) \geq (70)^5$

$75+60+73+81+x \geq 350$
$289 + x \geq 350$
$-289 \quad -289$
$x \geq 61$

At least a 61

40) QuickCopy charges $0.06 per page for black and white copies and $0.18 per page for color copies. Michelle's bill for 90 copies was $9.24. How many copies of each type did she make?

B = # Black + white copies
C = # Color copies

$-6(B + C = 90) \Rightarrow$
$100(.06B + .18C = 9.24)$

$-6B - 6C = -540$
$6B + 18C = 924$

$\frac{12C}{12} = \frac{384}{12}$

$C = 32$

$B = 90 - 32 = 58$

58 Black + white Copies
32 Color Copies

41) Rob paid $212.70 for a new copier including the 6.35% sales tax. What was the price of the copier before sales tax.

x = price before tax

$x + .0635x = 212.70$

$\frac{1.0635x}{1.0635} = \frac{212.70}{1.0635}$

$x = 200$

$200

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

Find two integers that have a sum of -4 and a product of -45

Factors of -45 :

	Sum
1, -45	-44
3, -15	-12
5, -9	-4

Bonus: 5, -9