Instructor: **Dr. Francesco Strazzullo**   Name _____*Key*_____
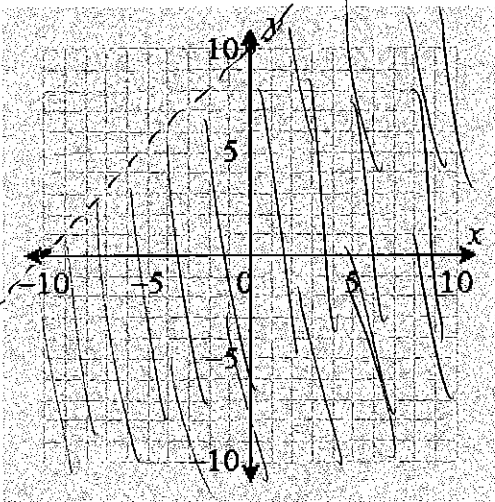
Instructions. Only calculators are allowed on this examination. Each problem is worth 10 points. Always use the appropriate wording and units of measure in your answers (when applicable). **SHOW YOUR WORK NEATLY, PLEASE (no work, no credit).**

1.   Solve the linear equation and simplify your answer.

$LCD = 15 \longrightarrow 15\left(-\frac{1}{3}x - \frac{6}{5} = -\frac{1}{5}x - \frac{5}{3}\right)$

$-5x - 18 = -3x - 25$

$\underline{+3x + 18 \qquad +3x + 18}$

$\dfrac{-2x}{-2} = \dfrac{-7}{-2}$

$\boxed{x = \dfrac{7}{2}}$

2.   Graph the solution set of the following linear inequality:

$$4 - 5y > -46 - 5x$$

SOLVE FOR Y:

$\dfrac{-5y}{-5} > \dfrac{-5x}{-5} \dfrac{-46 - 4}{-5}$

$y < x + 10$

3. Consider the graph of the line connecting the given points, A and B.
$$A(-4, -3), B(8, -9)$$

Step 1. Find the slope. If applicable, write "Undefined" for the slope.

$$m = \text{SLOPE} = \frac{Y_1 - Y_2}{X_1 - X_2} = \frac{-3 - (-9)}{-4 - 8} = \frac{6}{-12} = \boxed{\frac{-1}{2}}$$

Step 2. Find the y-intercept (if there is one).

$$Y = mx + b \xrightarrow{\text{STEP 1}} Y = -\frac{1}{2}x + b \left.\begin{array}{c} \end{array}\right] \to -9 = -\frac{1}{2}(8) + b \to$$

PLUG ANY OF THE POINTS; HERE $B(8, -9)$
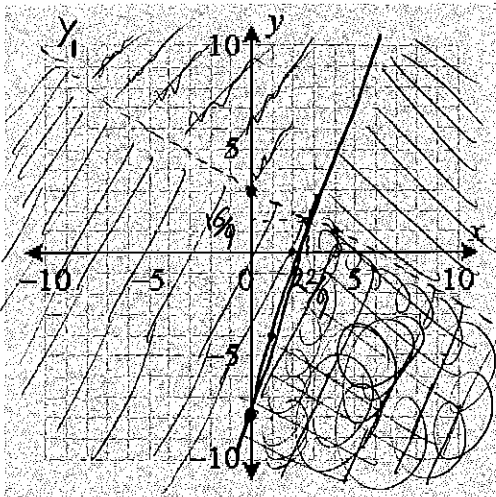
$$\begin{array}{cc} +4 & +4 \end{array}$$

$$\to \boxed{b = -5}$$

Step 3. Determine the equation of the line.

$$\boxed{Y = -\frac{1}{2}x - 5}$$

4. Solve the system of two linear inequalities graphically.
$$\begin{cases} 6y < -3x + 18 & \to \text{DIVIDE BY 6} \\ 8x \geq 2y + 16 & \to \text{SOLVE FOR } Y \end{cases}$$

Graph both inequalities (labeling the boundary lines), shade the region which satisfies the solution set, and label the corner point.

$$\text{INEQ}_1: \quad Y < -\frac{1}{2}x + 3 \quad (Y_1 \text{ DASHED, BELOW})$$

$$\text{INEQ}_2: \quad \frac{2Y}{2} \leq \frac{8x}{2} - \frac{16}{2}$$

$$Y \leq 4x - 8 \quad \left(Y_2 \text{ SOLID, BELOW}\right)$$

CORNER POINT: $Y_1 = Y_2 \to -\frac{1}{2}x + 3 = 4x - 8$

$$X = \frac{22}{9} \qquad \begin{array}{cc} +\frac{1}{2}x + 8 & +\frac{1}{2}x + 8 \end{array}$$

$$\downarrow \qquad \qquad \left(\frac{9}{2}x = 11\right)\frac{2}{9}$$

$$Y = -\frac{1}{2}\left(\frac{22}{9}\right) + 3 = \frac{16}{9}$$

5. A dairy farmer wants to mix a 80% protein supplement and a standard 40% protein ration to make 1800 pounds of a high-grade 45% protein ration. How many pounds of each should he use?

ITEMS	Q	R	Q·R
STD. SUPPLEM.	X	.40	.4X
HIG. SUPPL	Y	.80	.8Y
TOTAL	1800 lb	.45	810

MULT ─○

ADD ↓   ↓ ADD

ANSWER: 1575 POUNDS AT 40%
AND 225 POUNDS AT 80%

EQ.1 ⟶ $X + Y = 1800$

EQ.2 ⟶ $.4X + .8Y = 810$

$-.4 EQ.1: -.4X - .4Y = -720$

$$\frac{.4Y}{.4} = \frac{90}{.4} \longrightarrow Y = 225$$

$X + 225 = 1800 \longrightarrow X = 1575$
$-225 \quad -225$

6. Solve the following system of linear equations. Please determine whether the given system of linear equations is consistent, inconsistent, or dependent. If the system is consistent, please indicate the solution.

$\begin{cases} 2y & = & 6x - 24 \\ -3x + y & = & -27 \end{cases}$

$+3x \qquad\qquad +3x$

$Y = \dfrac{6}{2}X - \dfrac{24}{2} \longrightarrow Y = 3X - 12$

$Y = 3X - 27$

⟶ SAME SLOPE

BUT DIFFERENT INTERCEPTS ⟶ PARALLEL LINES ⟶

⟶ THE SYSTEM IS INCONSISTENT.

7. Multiply the binomials using the FOIL method. Combine like terms.
$$(7x^3 + 6)(x^3 + 8)$$

$7x^3(x^3) + 7x^3(8) + 6(x^3) + 6(8)$

$7X^{3+3} + 56X^3 + 6X^3 + 48$

$7x^6 + 62x^3 + 48$

8. Find the product of the binomial factors using the appropriate special product (difference of two squares, square of a binomial sum, or square of a binomial difference).

$$(2x + 8y)^2$$

$(A+B)^2 = A^2 + 2AB + B^2$, HERE $A = 2X$ AND $B = 8Y$:

$(2x)^2 + 2(2x)(8y) + (8y)^2$

$$\boxed{4x^2 + 32xy + 64y^2}$$

9. Completely factor the trinomial. If the trinomial cannot be factored, write *not factorable*.

$$x^2 - 11x + 28$$

PRODUCT = 28
SUM = -11 $\Big\} \to -4, -7 \to \boxed{(x-4)(x-7)}$

10. Completely factor the trinomial. If the trinomial cannot be factored, write *not factorable*.

$$3b^2 + 19b + 6$$

PRODUCT: $3 \cdot 6 = 18$
SUM: 19 $\Big\} \to 18, 1 \to 3b^2 + 18b + b + 6$

$3b(b+6) + (b+6)$

$$\boxed{(3b+1)(b+6)}$$

4

11. In a zoo, the ratio of adults to children is 15 to 6. If there are 168 people in the zoo, how many children are there?

$$\frac{ADULTS}{CHILDREN} = \frac{15}{6} = \frac{5}{2}$$

PEOPLE = ADUL. + CHILD. ⎤
ASKED FOR CHILDREN = X ⎦ → ADULTS = 168 − X ⎦ → $\frac{168-X}{X} = \frac{5}{2}$ →

→ $2(168 - X) = 5X$ → $336 - 2X = 5X$ → $\frac{7X}{7} = \frac{336}{7}$

 $+2X$ $+2X$

$$X = 48$$

$$\boxed{48 \ CHILDREN}$$

12. The volume of a gas in a container varies inversely with the pressure on the gas. If a gas has a volume of 410 cubic inches under a pressure of 7 pounds per square inch, what will be its volume if the pressure is increased to 17 pounds per square inch? (Round off your answer to the nearest cubic inch.)

$$V \cdot P = K \qquad OR \qquad V = \frac{K}{P}$$

PLUG DATA: $410 \cdot 7 = K$ → $K = 2870$ ⎦ → PLUG $P = 17$

$$V = \frac{2870}{17} \approx 168.82 \quad CUBIC \ INCHES$$

5