COLLEGE ALGEBRA   EXAM 3 CG   R^2   NAME _____

SHOW ALL WORK ON THIS TEST OR ON SEPARATE PAPER. Circle answers.
TURN IN <u>ALL</u> WORKSHEETS. CALCULATORS ARE REQUIRED ON THIS TEST.

1. Solve the systems of equations:

a) $50x - 9y = 1$
     $7x - 2y = -8$

b) $y = 2x - 4$
     $4x - 2y = 8$

2. Solve the system:

$3x + 2y + 5z = 2$
$2x - 3y + 2z = -4$
$x + 4y + 2z = 2$

3. Solve the system:

$3x + 2y = -2$
$2y - 3z = 1$
$x - 2y + 2z = 4$

4. Solve the system:

$y^2 - x^2 = 105$
$y = 3x - 5$

5. Solve the system:

$xy = -12$
$2x - y = -11$

6. Evaluate the determinants:

a)
$$\begin{vmatrix} -6 & 5 \\ -3 & 2 \end{vmatrix}$$

b)
$$\begin{vmatrix} -3 & 2 \\ -6 & 5 \end{vmatrix}$$
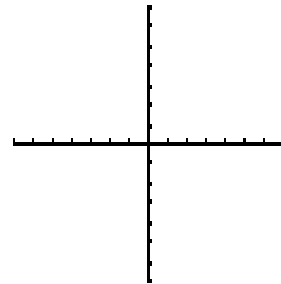
7. Evaluate the determinant:

$$\begin{vmatrix} 6 & 0 & -5 \\ -3 & -7 & 3 \\ 5 & 9 & -8 \end{vmatrix}$$

8. Solve by Cramer's Rule:

$$x - 2y = 8$$
$$-8x + 6y = 32$$

9. Graph the intersection:

$$x \geq 0$$
$$2x - 3y \geq 12$$
$$7x + 4y > 28$$

10. Find the remainder if $x^7 - 6x^2 + 3$ is divided by $x - 1$.

11. Find a quadratic equation whose roots are $x = 5 \pm 3i$.

12. Solve for x. Give irrational roots in radical form:

$x^4 - x^3 - 2x^2 + x + 1 = 0$

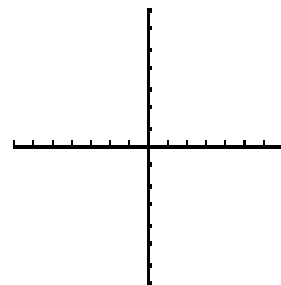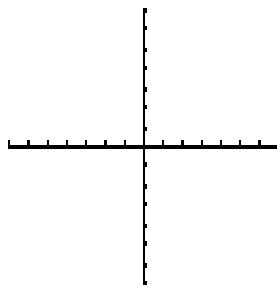**In 13 - 14, find all roots and multiplicities by synthetic division:**

13. $x^3 + x^2 - 8x - 12 = 0$

14. $x^4 - 5x^3 + x^2 + 21x - 18 = 0$

In 15 - 16, sketch the graphs and give roots:

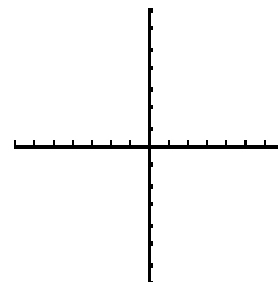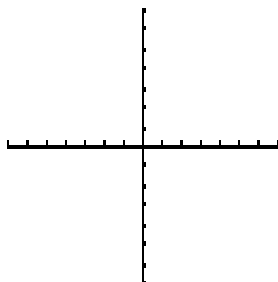**15.** $y = (x - 2)^3(x + 3)^2(x - 4)$

16. $y = x^3 + 2x^2 - 4x - 8$

In 17 - 20, solve the inequalities. Give interval notation.
        Sketch graphs when using graphing methods.

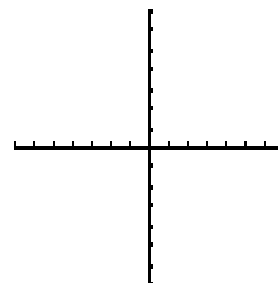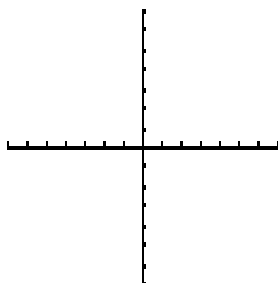**17.** $|x + 8| \geq 6$ **18.** $-7x^2 + 40x > -12$ **(Give exact form!)**

19. $\dfrac{12}{x} \leq 3$ **20.** $\dfrac{x^2 - 4x}{(x + 5)^2} > 0$

COLLEGE ALGEBRA EXAM 3 CG Solutions.

1a) $50x - 9y = 1$
$7x - 2y = -8$
2nd Simult: $(2, 11)$

b) $y = 2x - 4$
$4x - 2y = 8$
$4x - 2(2x-4) = 8$
$4x - 4x + 8 = 8$
$8 = 8$
Same Line

2. 2nd Simult
$(-6, 0, 4)$

3. 2nd Simult
$(2, -4, -3)$

4. $y^2 - 4x^2 = 105$
$y = 3x - 5$
$(3x-5)^2 - 4x^2 = 105$
$9x^2 - 30x + 25 - 4x^2 = 10$
$5x^2 - 30x - 80 = 0$
$5(x^2 - 6x - 16) = 0$
$5(x-8)(x+2) = 0$
$x = 8 \qquad x = -2$
$y = 3x - 5 \qquad y = 3x - 5$
$\quad = 24 - 5 \qquad = -6 - 5$
$\quad = 19 \qquad\quad = -11$
$(8, 19) \qquad (-2, -11)$

5. $xy = -12$
$2x - y = -11$
$2x + 11 = y$
$x(2x + 11) = -12$
$2x^2 + 11x + 12 = 0$
$(2x + 3)(x + 4) = 0$
$x = -\frac{3}{2} \quad x = -4$
$y = 2(-\frac{3}{2}) + 11 \quad y = 2(-4) + 11$
$\quad = -3 + 11 \qquad\quad = -8 + 11$
$\quad = 8 \qquad\qquad = 3$
$(-\frac{3}{2}, 8) \qquad (-4, 3)$

6a) $\begin{vmatrix} -6 & 5 \\ -3 & 2 \end{vmatrix} = -12 + 15 = 3$

b) $\begin{vmatrix} -3 & 2 \\ -6 & 5 \end{vmatrix} = -15 + 12 = -3$

7. $\begin{vmatrix} 6 & 0 & -5 \\ -3 & -1 & 3 \\ 15 & 19 & -8 \end{vmatrix}$
$= 336 + 0 + 135 - 175 - 162 - $
$= 134$
Recommend
Matrix = 134

8. $x - 2y = 8$
$-8x + 6y = 32$
$x = \dfrac{\begin{vmatrix} 8 & -2 \\ 32 & 6 \end{vmatrix}}{\begin{vmatrix} 1 & -2 \\ -8 & 6 \end{vmatrix}} = \dfrac{112}{-10} = -11.2$
$y = \dfrac{\begin{vmatrix} 1 & 8 \\ -8 & 32 \end{vmatrix}}{-10} = \dfrac{96}{-10} = -9.6$

9. $x \geq 0 \qquad \rightarrow$ Right of y axis!
$2x - 3y \geq 12 \qquad 7x + 4y > 28$

x	y
0	-4
6	0

x	y
0	7
4	0

Shade below   Shade above
Solid Line   Dotted Line

10. $P(x) = x^7 - 6x^2 + 3$
$P(1) = 1 - 6 + 3$
$= -2$

11. $x = \dfrac{5 \pm 3i}{?}$
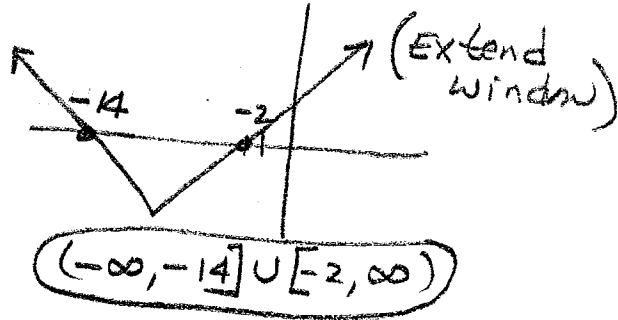$(x - 5) = (\pm 3i)^2$
$x^2 - 10x + 25 = 9i^2 = -9$
$x^2 - 10x + 34 = 0$

12. $x^4 - x^3 - 2x^2 + x + 1 = 0$
Roots at $x = \pm 1$.

$\begin{array}{r|rrrrr} 1 & 1 & -1 & -2 & 1 & 1 \\ & & 1 & 0 & -2 & -1 \\ \hline -1 & 1 & 0 & -2 & -1 & 0 \\ & & -1 & 1 & 1 \\ \hline & 1 & -1 & -1 & 0 \end{array}$
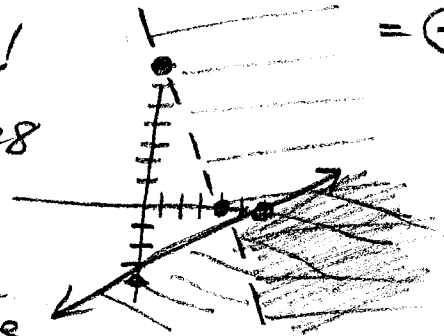
$x^2 - x - 1 = 0$
$x = \dfrac{1 \pm \sqrt{1 - 4(-1)}}{2} = \dfrac{1 \pm \sqrt{5}}{2}$

13. $x^3 + x^2 - 8x - 12 = 0$
$\begin{array}{r|rrrr} 3 & 1 & 1 & -8 & -12 \\ & & 3 & 12 & 12 \\ \hline & 1 & 4 & 4 & 0 \end{array}$
$x^2 + 4x + 4 = 0$
$(x + 2)^2 = 0$
$x = 3, \quad x = -2 \ (\text{mult } 2)$

14. $x^4 - 5x^3 + x^2 + 21x - 18 = 0 \qquad x = \pm 1$
$\begin{array}{r|rrrrr} 1 & 1 & -5 & 1 & 21 & -18 \\ & & 1 & -4 & -3 & 18 \\ \hline 3 & 1 & -4 & -3 & 18 & 0 \\ & & 3 & -3 & -18 \\ \hline & 1 & -1 & -6 & 0 \end{array}$
$x^2 - x - 6 = 0$
$(x - 3)(x + 2) = 0$
$x = 3 \ (\text{mult } 2) \quad x = -2, \quad x = 1$

15. $y = (x-2)^3 (x+3)^2 (x-4)$
Roots $x = 2 \quad x = -3 \quad x = 4$
$\quad\quad\ \text{Pass} \quad\ \text{Bounce} \quad \text{Pass}$

16. $y = x^3 + 2x^2 - 4x - 8$
$\begin{array}{r|rrrr} 2 & 1 & 2 & -4 & -8 \\ & & 2 & 8 & 8 \\ \hline & 1 & 4 & 4 & 0 \end{array}$
$x^2 + 4x + 4 = 0$
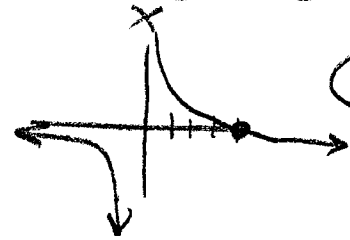$(x + 2)^2 = 0$
Roots
$x = 2 \ \text{A}$
$x = -2 \ \text{B}$

17. $|x+8| \geq 6$ (On or above X axis!)

$y_1 = abs(x+8) - 6$

(Extend window)

-14 -2

$$(-\infty, -14] \cup [-2, \infty)$$

18. $-7x^2 + 40x > -12$

$-7x^2 + 40x + 12 > 0$ Above X axis

$-1(7x^2 - 40x - 12) > 0 \longrightarrow$ Use 2nd Poly.

$(7x+2)(x-6)$ $7x^2 - 40x - 12 = 0$

$x = -\frac{2}{7} \quad x = 6$

Graph $y_1 = (-) 7x^2 - 40x - 12$

$$\left(-\frac{2}{7}, 6\right)$$

$-\frac{2}{7}$ 6

19. $\frac{12}{x} \leq 3$

$y_1 = \frac{12}{x} - 3 \leq 0$ (On or below X axis!)

$\frac{12 - 3x}{x} \leq 0$ $x \neq 0$ Asymptote.

$x = 4$ Root.

$$(-\infty, 0) \cup [4, \infty)$$
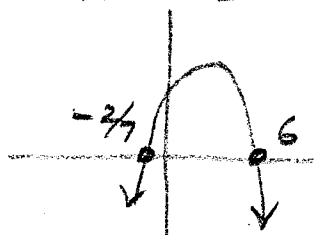
20. $\frac{x^2 - 4x}{(x+5)^2} > 0$

$y_1 = (x^2 - 4x) \div ((x+5)^2)$

Above X axis.

Roots at $x = 0$, $x = 4$

Asymptote $x = -5$!

$$(-\infty, -5) \cup (-5, 0) \cup (4, \infty)$$