COLLEGE ALGEBRA   EXAM 3 EG R^2 NAME _____

SHOW ALL WORK ON THIS TEST OR ON SEPARATE PAPER. Circle answers.
TURN IN ALL WORKSHEETS.   WHERE CALCULATORS ARE USED, BE SURE TO
DESCRIBE PROCEDURES AND/OR SKETCH GRAPHS.

1.   Evaluate the determinants:

a) $\begin{vmatrix} 6 & -3 \\ -3 & -2 \end{vmatrix}$ b) $\begin{vmatrix} 3 & 2 \\ 0 & 0 \end{vmatrix}$

2.   Evaluate the determinant:

$$\begin{vmatrix} 6 & -2 & -5 \\ -3 & 7 & 0 \\ 5 & 9 & -8 \end{vmatrix}$$

3.   Solve the systems of equations:
     a)   7X + 3Y = 6   b)   X = 3Y + 18
          3X + 2Y = -1   6Y - 2X = -36

4.   Solve by Cramer's Rule: 5.   Graph the intersection:

         X + 2Y = 7   X - Y < 3
       -3X + 5Y = 34   Y ≤ -2X + 2
                                               X ≥ 0

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6. Solve the system:

    $$3X + 4Y + Z = 2$$
    $$7X + 2Y + 4Z = 5$$
    $$-2X + Y - 2Z = -6$$

7. Solve the system:

    $$XY = -12$$
    $$Y = 2X + 11$$

8. Find the remainder if $X^7 + 6X^2 + 3$ is divided by $X + 1$.

9. Find a quadratic equation whose roots are $X = -6 \pm 2i$.

10. Solve for X, using synthetic division and graphing calculators. Give irrational roots in radical form:

    $$X^4 + 2X^3 - 16X^2 + 8X + 16 = 0$$

In 11 - 12, find all roots and multiplicities:

11. $X^3 + 2X^2 - 5X - 6 = 0$ 12. $X^4 - 8X^3 + 23X^2 - 28X + 12 = 0$

In 13 - 14, sketch the graphs (give roots and Y intercepts):

13. $Y = -(X + 2)^2 (X - 3)^3 (X + 4)^2$ 14. $Y = X^4 + 2X^3 - 8X^2$

In 15 - 17, solve the inequalities and give interval notation:

15. $X^2 - 10X - 24 \geq 0$ 16. $\dfrac{12}{X} \leq 3X$

17. $\dfrac{X^2 + 3X - 10}{(X - 3)^2} > 0$

COLLEGE ALGEBRA EXAM 3 EG Solutions

1a) $\begin{vmatrix} 6 & -3 \\ -3 & -2 \end{vmatrix} = -12 - 9 = \boxed{-21}$

b) $\begin{vmatrix} 3 & 2 \\ 0 & 0 \end{vmatrix} = 0 - 0 = \boxed{0}$

2.
$\begin{array}{ccc} 6 & -2 & -5 \\ -3 & 4 & 0 \\ 8 & 9 & -8 \end{array}$ $\begin{array}{cc} 6 & -2 \\ -3 & 7 \\ 8 & 9 \end{array}$

$-175 \quad 0 \quad -48 \quad -336 \quad 0 \quad 135$

$-336 + 135 - (-175) - (-48) = \boxed{22}$

$\boxed{2^{nd}}\boxed{7}$ $\boxed{F2\ (EDIT)}$ (Name it) 3×3 ENTER
Enter numbers $\boxed{EXIT}$ $\boxed{2^{nd}}$ $\boxed{7}$
$\boxed{F3\ (MATH)}$ $\boxed{F1(det)}$ EXIT
$\boxed{F1\ (NAMES)}$ (Name it) ENTER
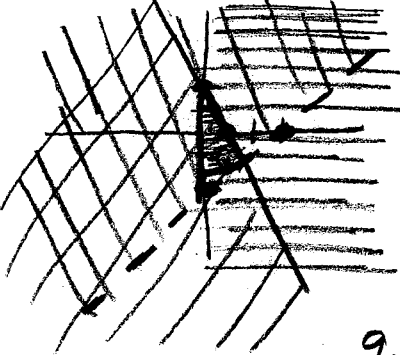ANSWER = $\boxed{22}$

3. 2nd Simult: Number = 2
a) $7x + 3y = 6$
$3x + 2y = -1$
$\boxed{(3, -5)}$

A) Simult does not work!
$x = 3y + 18$
$6y - 2x = -36$
$6y - 2(3y + 18) = -36$
$6y - 6y - 36 = -36$ Always True $\boxed{\text{Same Line}}$

4. $x + 2y = 7$
$-3x + 5y = 34$
$x = \dfrac{\begin{vmatrix} 7 & 2 \\ 34 & 5 \end{vmatrix}}{\begin{vmatrix} 1 & 2 \\ -3 & 5 \end{vmatrix}}$ $y = \dfrac{\begin{vmatrix} 1 & 7 \\ -3 & 34 \end{vmatrix}}{\begin{vmatrix} 1 & 2 \\ -3 & 5 \end{vmatrix}}$

$= \dfrac{35 - 68}{5 + 6}$ $= \dfrac{34 + 21}{11}$

$= \dfrac{-33}{11} = \boxed{-3}$ $= \dfrac{55}{11} = \boxed{5}$

5. $x - y < 3$ $y \le -2x + 2$
$\begin{array}{c|c} x & y \\ 0 & -3 \\ 3 & 0 \end{array}$ yint = 2 $m = \dfrac{-2}{1}$
Shade above Shade Below
Dotted Line Solid Line
$x \ge 0$
y axis
Solid Line
Shade right.
$\boxed{\text{Triangular Region!}}$

6. $3x + 4y + z = 2$
$7x + 2y + 4z = 5$
$-2x + y - 2z = -6$
Use: 2nd Simult Number = 3
$\boxed{(-5, 2, 9)}$

7. $xy = -12$
$y = 2x + 11$
$x(2x + 11) = -12$
$2x^2 + 11x + 12 = 0$
2nd Poly $x_1 = -4$, $x_2 = -1.5$
$y = 2x + 11$ $y = 2(-1.5) + 11$
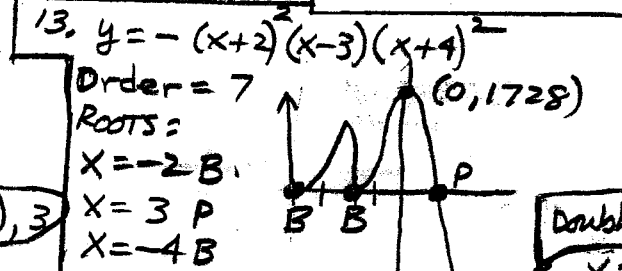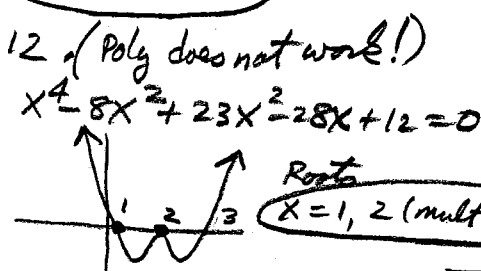$y = 2(-4) + 11$ $= -3 + 11$
$y = 3$ $= 8$
$\boxed{(-4, 3)}$ $\boxed{(-3/2, 8)}$

8. $(x^7 + 6x^2 + 3) \div (x + 1)$
$P(-1) = (-1)^7 + 6(-1)^2 + 3$
$= -1 + 6 + 3 = \boxed{8}$
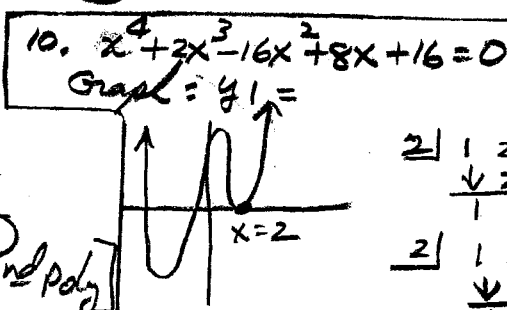
9. $x = -6 \pm 2i$
$x + 6 = \pm 2i$
$(x + 6)^2 = 4i^2$
$x^2 + 12x + 36 = -4$
$\boxed{x^2 + 12x + 40 = 0}$
$\boxed{\text{You may check by } 2^{nd} \text{ Poly}}$

10. $x^4 + 2x^3 - 16x^2 + 8x + 16 = 0$
Graph: $y_1 =$
$x = 2$

$2 \underline{|\ 1 \quad 2 \quad -16 \quad 8 \quad 16}$
$\ \ \downarrow\ \ 2 \quad 8 \quad -16 \quad -16$
$\ \ 1 \quad 4 \quad -8 \quad -8 \quad 0$

$2 \underline{|\ 1 \quad 4 \quad -8 \quad -8}$
$\ \ \downarrow\ \ 2 \quad 12 \quad 8$
$\ \ 1 \quad 6 \quad 4 \quad 0$

$x^2 + 6x + 4 = 0$
$x^2 + 6x + \underline{\ \ } = -4 + \underline{\ \ }$
$x^2 + 6x + 9 = -4 + 9$
$(x + 3)^2 = 5$
$x + 3 = \pm\sqrt{5}$
Double root $\boxed{x = 2}$ $\boxed{x = -3 \pm \sqrt{5}}$

11. $x^3 + 2x^2 - 5x - 6 = 0$
2nd Poly Order = 3
$1, 2, -5, -6$
$\boxed{x = -3, -1, 2}$ all mult 1

12. (Poly does not work!)
$x^4 - 8x^3 + 23x^2 - 28x + 12 = 0$

Roots $\boxed{x = 1, 2 \ (\text{mult } 2), 3}$

$1 \underline{|\ 1 \quad -8 \quad 23 \quad -28 \quad 12}$
$\ \ \downarrow\ \ 1 \quad -7 \quad 16 \quad -12$
$2 \underline{|\ 1 \quad -7 \quad 16 \quad -12 \quad 0}$
$\ \ \downarrow\ \ 2 \quad -10 \quad 12$
$\ \ 1 \quad -5 \quad 6 \quad 0$
$x^2 - 5x + 6 = 0$
$(x - 2)(x - 3) = 0$
$x = 2 \quad x = 3$

13. $y = -(x + 2)^2 (x - 3)(x + 4)^2$
Order = 7
ROOTS:
$x = -2$ B
$x = 3$ P
$x = -4$ B
yint = 1728
$(0, 1728)$

14. $y = x^4 + 2x^3 - 8x^2$
$= x^2(x^2 + 2x - 8)$
$= x^2(x + 4)(x - 2)$
$x = 0$ B
$x = -4$ P
$x = 2$ P
yint = 0

15. $(x - 12)(x + 2) \ge 0$
$x = 12 \quad x = -2$
$\boxed{(-\infty, -2] \cup [12, \infty)}$

16. $\dfrac{12}{x} - 3x \le 0$
on or Below x axis
$\boxed{[-2, 0) \cup [2, \infty)}$

17. $\dfrac{(x + 5)(x - 2)}{(x - 3)} > 0$
$x \ne 3$ above x axis
$\boxed{(-\infty, -5) \cup (2, 3) \cup (3, \infty)}$