COLLEGE ALGEBRA   EXAM 3 DG3 R^2 NAME _____

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

1.   Solve the systems of equations. (Any method, but explain or show what you did.)

a) $9x - 4y = 2$ b) $x = 3y - 18$
        $2x + 5y = -29$ $6y - 2x = 36$

2.   Solve the system: 3.   Solve the system:
    $3x + y + z = 8$ $3x - 5y = 1$
    $2x + 2y - z = 10$ $4x + 3z = 0$
    $x - 3y + 2z = -4$ $3y + 2z = 2$

4.   Solve the system: 5.   Solve the system:
    $y = -2x + 10$ $3y^2 - 4x^2 = -4$
    $y = x^2 + 3x - 4$ $y = x - 4$

6.   Give roots, multiplicities, and graph :

    $y1 = (x - 2)^2 (x + 3)^3 (x - 4)^2$

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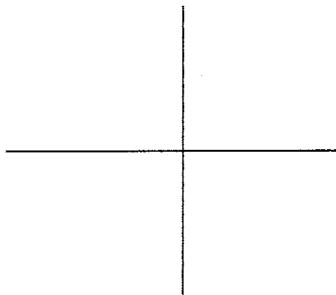
7.   **Graph the intersection:**
$$x > 0$$
$$2x + 3y \geq -12$$
$$7x - 2y < 14$$
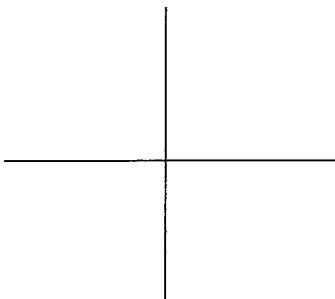
8.   **Find the remainder if** $x^7 + 6x^2 - 3$ **is divided by** $x + 1$.

9.   **Find a quadratic equation whose roots are** $x = -9$ **and** $x = 6$.

10.   **Find an equation whose roots are** $x = -6$ **and** $x = -4 \pm 6i$.

In 11 - 13, find all roots and multiplicities by synthetic division:

11. $x^3 + x^2 - 8x - 12 = 0$ 12. $x^4 + x^3 - 7x^2 - 13x - 6 = 0$

13. Use your calculator to find all roots. Verify by synthetic division.
   Give irrational roots in radical form:

$$x^4 + 2x^3 - 13x^2 - 8x + 6 = 0$$

In 14 - 15, give the roots and y-intercepts and sketch the graphs:

14. $y = x^3 + 13x^2 - 30x$ **15.** $y = -x^4 + 10x^2 - 9$
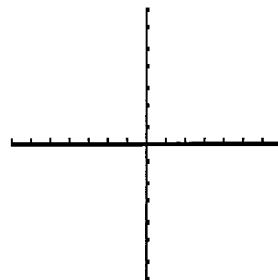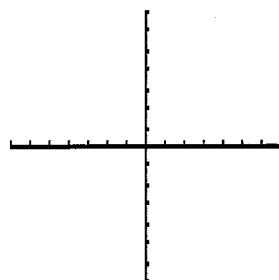
**In 16 - 17, solve the inequalities. Give interval notation.**
   **Sketch graphs when using graphing methods.**

16a) $|x + 4| \geq 8$ **17a)** $-x^2 + 3x + 10 \leqslant 0$

b) $|x + 4| < 8$ **b)** $-x^2 + 3x + 10 > 0$
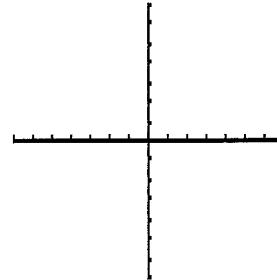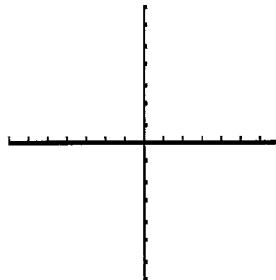
COLLEGE ALGEBRA EXAM 3 DG3 Solutions

1a) $9x - 4y = 2$
$2x + 5y = -29$
[Polysmlt] $(-2, 5)$

b) $x = 3y - 18$
$6y - 2x = 36$
$6y - 2(3y - 18) = 36$
$6y - 6y + 36 = 36$
SAME LINE

2. $3x + y + z = 8$
$2x + 2y - z = 10$
$x - 3y + 2z = -4$
[Polysmlt] $(3, 1, -2)$

3. $3x - 5y + 0 = 1$
$4x + 0 + 3z = 0$
$0 + 3y + 2z = 2$
[Polysmlt] $(-3, -2, 4)$

4. $y = -2x + 10$
$y = x^2 + 3x - 4$
$-2x + 10 = x^2 + 3x - 4$
$0 = x^2 + 5x - 14$
$0 = (x + 7)(x - 2)$
$x = -7 \quad x = 2$
$y = -2(-7) + 10 \quad y = -2(2) + 10$
$y = 24 \quad\quad y = 6$
$(-7, 24) \quad (2, 6)$

5. $3y^2 - 4x^2 = -4$
$y = x - 4$
$3(x-4)^2 - 4x^2 = -4$
$3(x^2 - 8x + 16) - 4x^2 = -4$
$3x^2 - 24x + 48 - 4x^2 = -4$
$-x^2 - 24x + 52 = 0$
$x^2 + 24x - 52 = 0$
$(x + 26)(x - 2) = 0$
$x = -26 \quad x = 2$
$y = \overset{-26}{x} - 4 \quad y = \overset{2}{x} - 4$
$y = -30 \quad\quad y = -2$
$(-26, -30) \quad (2, -2)$

6. $y_1 = (x-2)^2 (x+3)^3 (x-4)^2$
ROOTS: $x = 2$ (mult 2), $x = -3$ (mult 3)
$x = 4$ (mult 2)

9. $x = -9 \quad x = 6$
$(x + 9)(x - 6) = 0$
$x^2 + 3x - 54 = 0$

7. $x > 0$ (y-axis) $\quad 2x + 3y \geq -12$

x	y
0	-4
-6	0

Solid Line
Shade Above

$7x - 2y < 14$

x	y
0	-7
2	0

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

— OR —

$-1 | 1 \quad 0 \quad 0 \quad 0 \quad 6 \quad 0 \quad -3$
$ \downarrow -1 \quad 1 \; -1 \; 1 \; -1 \; -5 \quad 5$
$\overline{1 \; -1 \; 1 \; -1 \; 1 \; 5 \; -5 \quad 2}$
Remainder = 2

10. $x = -6 \quad\quad x = -4 \pm 6i$
$x + 6 = 0 \quad x + 4 = \pm 6i$
$\quad\quad\quad (x + 4)^2 = (\pm 6i)^2$
$\quad\quad\quad x^2 + 8x + 16 = 36i^2$
$\quad\quad\quad x^2 + 8x + 16 = -36$
$(x + 6)(x^2 + 8x + 52) = 0$
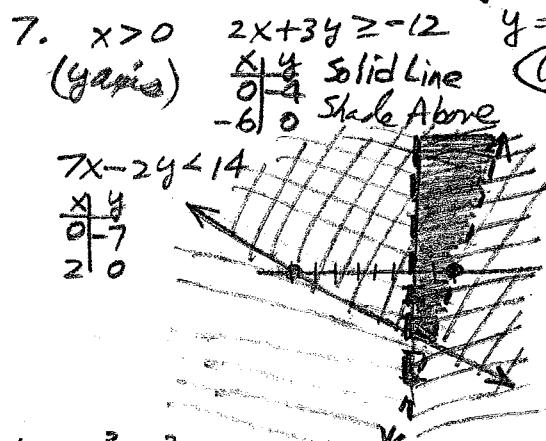
11. $x^3 + x^2 - 8x - 12 = 0$
Use [POLYSMLT] to find $x = -2, -2, 3$

$3 | 1 \quad 1 \quad -8 \quad -12$
$ \downarrow \; 3 \quad 12 \quad 12$
$\overline{1 \quad 4 \quad 4 \quad 0}$

$x^2 + 4x + 4 = 0$
$(x + 2)^2 = 0$
$x = 3, \; x = -2$ (mult 2)

12. $x^4 + x^3 - 7x^2 - 13x - 6 = 0$
Use [POLYSMLT] to find $x = 3, -2, -1, -1$

$3 | 1 \quad 1 \quad -7 \quad -13 \quad -6$
$ \downarrow \; 3 \quad 12 \quad 15 \quad 6$
$-2 \overline{| 1 \quad 4 \quad 5 \quad 2 \quad 0}$
$ \downarrow -2 \; -4 \; -2$
$\overline{1 \quad 2 \quad 1 \quad 0}$

$x^2 + 2x + 1 = 0$
$(x + 1)^2 = 0$
$x = 3, -2, x = -1$ (mult 2)
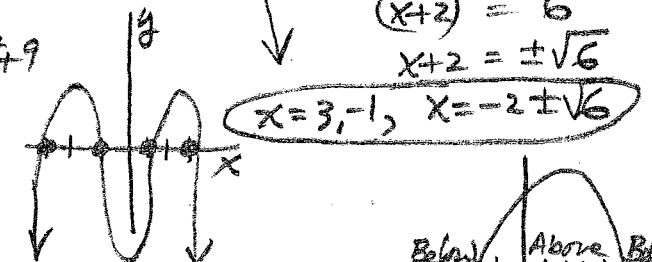
13. $x^4 + 2x^3 - 13x^2 - 8x + 6 = 0$
Use [POLYSMLT]: $3, -1$

$3 | 1 \quad 2 \quad -13 \quad -8 \quad 6$
$ \downarrow \; 3 \quad 15 \quad 6 \quad -6$
$-1 \overline{| 1 \quad 5 \quad 2 \quad -2 \quad 0}$
$ \downarrow -1 \; -1 \; 2$
$\overline{1 \quad 4 \quad -2 \quad 0}$

$x^2 + 4x - 2 = 0$
$x^2 + 4x + \underline{} = 2 + \underline{}$
$x^2 + 4x + 4 = 2 + 4$
$(x + 2)^2 = 6$
$x + 2 = \pm\sqrt{6}$
$x = 3, -1, \; x = -2 \pm \sqrt{6}$

14. $y = x^3 + 13x^2 - 30x$
$y = x(x^2 + 13x - 30)$
$y = x(x + 15)(x - 2)$
$x = 0 \quad x = -15 \quad x = 2$
Be sure window shows
$y\,int = 0$

15. $y = -x^4 + 10x^2 + 9$
$y\,int = -9$
$x\,int = \pm 3, \pm 1$

16a) $|x + 4| \geq 8$
$x + 4 = 8 \quad x + 4 = -8$
$x = 4 \quad\quad x = -12$

a) $y_1 = |x + 4| - 8 \geq 0$ (Above)
$(-\infty, -12] \cup [4, \infty)$

b) $|x + 4| - 8 < 0$ (Below)
$(-12, 4)$
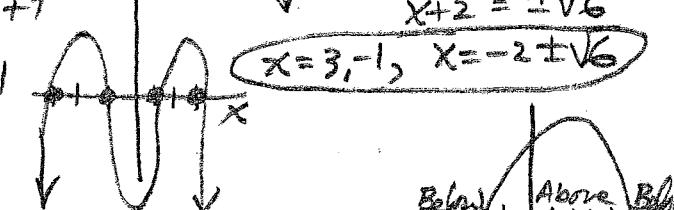
17a) $-x^2 + 3x + 10 \leq 0$
$-(x^2 - 3x - 10) = 0$
$(x - 5)(x + 2) = 0$
$x = 5 \quad x = -2$

a) Below $(-\infty, -2) \cup (5, \infty)$
b) Above $(-2, 5)$