

SHOW ALL WORK ON THIS TEST OR ON SEPARATE PAPER. If you use [GRAPH], sketch the graph. For all calculator solutions give steps used. TURN IN ALL WORKSHEETS.

1. Solve the systems of equations (any method):

$$\begin{aligned} \text{a) } 9X - 4Y &= 2 \\ 2X + 5Y &= -29 \end{aligned}$$

$$\begin{aligned} \text{b) } X &= 3Y - 18 \\ 6Y - 2X &= 36 \end{aligned}$$

2. Solve the system (any method):

$$\begin{aligned} 3X + Y + Z &= 8 \\ 2X + 2Y - Z &= 10 \\ X - 3Y + 2Z &= -4 \end{aligned}$$

3. Solve the system (any method):

$$\begin{aligned} 3X - 5Y &= 1 \\ 4X &+ 3Z = 0 \\ 3Y + 2Z &= 2 \end{aligned}$$

4. Solve the system (any method):

$$\begin{aligned} Y &= -2X + 10 \\ Y &= X^2 + 3X - 4 \end{aligned}$$

5. Solve the system (any method):

$$\begin{aligned} 3Y^2 - 4X^2 &= -4 \\ Y &= X - 4 \end{aligned}$$

6. Evaluate the determinants:

a) $\begin{vmatrix} 6 & 2 \\ -3 & -2 \end{vmatrix}$ b) $\begin{vmatrix} 3 & 5 \\ 1 & 0 \end{vmatrix}$

7. Evaluate the determinant:

$$\begin{vmatrix} 6 & -1 & -5 \\ -3 & -7 & 3 \\ 5 & 9 & -8 \end{vmatrix}$$

8. Solve by Cramer's Rule:

$$\begin{aligned} 8X - 6Y &= -32 \\ X - 2Y &= 6 \end{aligned}$$

9. Graph the intersection:

$$\begin{aligned} X - Y &> 3 \\ Y &\leq 2X - 2 \\ 2X + 3Y &\leq 6 \end{aligned}$$

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

11. Find a quadratic equation whose roots are $X = -4 \pm 6i$.

12. Find all roots. Give exact form of irrational roots.

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

In 13-14, use synthetic division to find all roots and multiplicities:

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

14. $X^4 + X^3 - 7X^2 - 13X - 6 = 0$

Sketch the graph:

15. $Y = (X - 2)^2 (X + 3)^3 (X - 4)^2$

Solve the inequality.
Give interval notation

16. $-X^4 + 10X^2 - 9 > 0$

17. Solve the inequality.
Give interval notation.

$$\frac{9}{X} \leq X$$

18. Solve the inequality.
Give interval notation.

$$\frac{X^2 + 3X - 10}{(X - 3)^2} \leq 0$$

COLLEGE ALGEBRA EXAM 3 DG2 Solutions

1a) $9x - 4y = 2$
 $2x + 5y = -29$
 2nd, SIMULT, Number=2
 Enter coef, F5 (SOLVE)
 $x = -2, y = -5$

b) $x = 3y - 18$ solve by elimination or substitution:
 $6y - 2x = 36$
 $x - 3y = -18$
 $-2x + 6y = 36$
 $0 = 0$
 SIMULT (ERROR 03) SAME LINE
 SINGULAR MAT

2. $3x + 1y + 1z = 8$
 $2x + 2y - 1z = 10$
 $1x - 3y + 2z = -4$
 2nd, SIMULT, Number=3,
 Enter coef, F5 (SOLVE)
 $(3, 1, -2)$

3. $3x - 5y + 0z = 1$
 $4x + 0y + 3z = 0$
 $0x + 3y + 2z = 2$
 Same as #2!
 $(-3, -2, 4)$

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

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

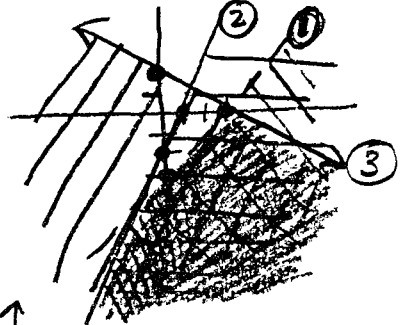
6a) $\begin{vmatrix} 6 & 2 \\ -3 & -2 \end{vmatrix} = -12 - (-6) = -6$
 b) $\begin{vmatrix} 3 & 5 \\ 1 & 0 \end{vmatrix} = 0 - 5 = -5$
 7. $\begin{vmatrix} 6 & -1 & -5 & 6 & -1 \\ -3 & -7 & 3 & -3 & -7 \\ 1 & 5 & -8 & 5 & 9 \end{vmatrix}$
 $(336 - 15 + 135) - (175 + 162 - 24)$
 $456 - 313 = 143$

8. $8x - 6y = -32$
 $x - 2y = 6$
 $x = \frac{\begin{vmatrix} -32 & -6 \\ 6 & -2 \end{vmatrix}}{\begin{vmatrix} 8 & -6 \\ 1 & -2 \end{vmatrix}} = \frac{100}{-10} = -10$
 $y = \frac{\begin{vmatrix} 8 & -32 \\ 1 & 6 \end{vmatrix}}{-10} = \frac{80}{-10} = -8$

$y = x - 4$
 $y = x - 4$
 $= -26 - 4 = -30$
 $= 2 - 4 = -2$
 $(-26, -30) (2, -2)$

-OR- CALCULATOR
 2nd, MATRX, F2 (Edit), (Name it)
 $\begin{bmatrix} 3 & 3 \end{bmatrix}$, enter coef, EXIT.
 CUSTOM, det, 2nd MATRX, NAMES
 (Name it), ENTER, 143

9. $x - y > 3$ ① Below
 $y \leq 2x - 2$ ② Below
 $2x + 3y \leq 6$ ③ Below



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

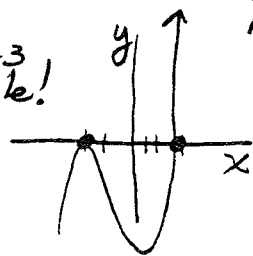
11. $x = 4 \pm 6i$
 $(x-4)^2 = (\pm 6i)^2$
 $x^2 - 8x + 16 = 36i^2 = -36$
 $x^2 - 8x + 52 = 0$

OR- $-1 \mid \begin{array}{ccccccccc} 1 & 0 & 0 & 0 & 0 & 6 & 0 & -3 \\ \downarrow & 1 & -1 & -1 & -1 & -5 & -5 & 5 \\ 1 & -1 & -1 & -1 & -5 & -5 & 2 \end{array}$

13. $x^3 + x^2 - 8x - 12 = 0$
 2nd POLY gives root $x = 3$
 others are not reliable!

12. $x^4 + 2x^3 - 13x^2 - 8x + 6 = 0$
 Use 2nd POLY or GRAPH to find roots at $x = -1$ and 3

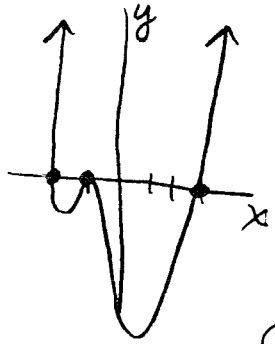
$3 \mid \begin{array}{cccc} 1 & 1 & -8 & -12 \\ \downarrow & 3 & 12 & 12 \\ 1 & 4 & 4 & 0 \end{array}$
 $x^2 + 4x + 4 = 0$
 $(x+2)^2 = 0$
 $x = 3 \quad x = -2$ (mult 2)



$-1 \mid \begin{array}{cccccc} 1 & 2 & -13 & -8 & 6 \\ \downarrow & -1 & -1 & -14 & 6 \\ 1 & 1 & -14 & 6 & 0 \\ 3 \mid \begin{array}{cccc} 1 & 1 & -14 & 6 \\ \downarrow & 3 & 12 & -6 \\ 1 & 4 & -2 & 0 \end{array} \end{array}$
 $x^2 + 4x - 2 = 0$
 $x^2 + 4x + 4 = 2 + 4$
 $(x+2)^2 = 6 \quad (x = -2 \pm \sqrt{6})$

14. $x^4 + x^3 - 7x^2 - 13x - 6 = 0$
 (2nd POLY does not work at ALL!)

GRAPH $y = x^4 + x^3 - 7x^2 - 13x - 6$



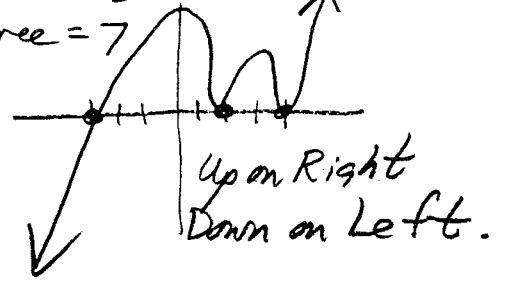
$$\begin{array}{r|rrrrr} 3 & 1 & 1 & -7 & -13 & -6 \\ & & \downarrow 3 & 12 & 15 & 6 \\ \hline & 1 & 4 & 5 & 2 & 0 \\ & & \downarrow -1 & -3 & -2 & \\ \hline & 1 & 3 & 2 & 0 & \end{array}$$

$x^2 + 3x + 2 = 0$
 $(x+2)(x+1) = 0$

$x = 3, x = -2, x = -1$ (mult 2)

15. $y = (x-2)^2 (x+3)^2 (x-4)^2$
 ROOTS $x=2$ $x=-3$ $x=4$
 B P B

Degree = 7



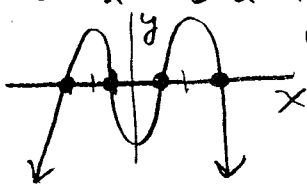
16. $-x^4 + 10x^2 - 9 > 0$

$-(x^4 - 10x^2 + 9) > 0$

$-(x^2 - 9)(x^2 - 1) > 0$ Above x axis!

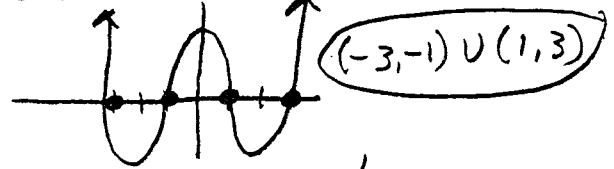
$-(x-3)(x+3)(x-1)(x+1) > 0$

$x = 3 \quad x = -3 \quad x = 1 \quad x = -1$



$(-3, -1) \cup (1, 3)$

OR - $x^2 - 10x^2 + 9 < 0$
 $(x^2 - 9)(x^2 - 1) < 0$ Below x axis
 $(x-3)(x+3)(x-1)(x+1) < 0$
 $x = 3 \quad x = -3 \quad x = 1 \quad x = -1$



$(-1, 1) \cup (3, 3)$

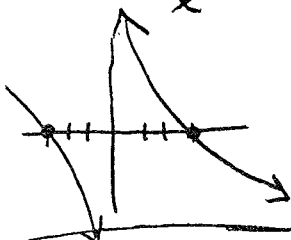
17. $\frac{9}{x} \leq x$

$\frac{9}{x} - x \leq 0$

$\frac{9-x^2}{x} \leq 0$ (on or below x axis!)

$\frac{(3-x)(3+x)}{x} \leq 0$

Endpts: $x = \pm 3$
 $x \neq 0$



$[-3, 0) \cup [3, \infty)$

18. $\frac{x^2 + 3x - 10}{(x-3)^2} \leq 0$ on or below x axis.
 $\frac{(x+5)(x-2)}{(x-3)^2} \leq 0$
 Endpts: $x = -5, 2$
 $x \neq 3$

on or below x axis: $[-5, 2]$

