College Algebra Exam 3 Forms A , B Dr. Rapalje

Show all work on this test or on separate paper.
Turn in all worksheets. Calculators are allowed.
1 FREE PROBLEM.

In 1-2, evaluate the determinants:

1a) $\begin{vmatrix} 4 & -6 \\ 3 & 5 \end{vmatrix}$

b) $\begin{vmatrix} 4 & -6 \\ 0 & 1 \end{vmatrix}$

2. $\begin{vmatrix} 5 & -2 & -3 \\ 6 & 1 & 4 \\ -1 & 9 & -8 \end{vmatrix}$

In 3-7, solve the systems of equations:

3. $2x+4y=16$
$3x-5y=-9$

4. $3x-5y=8$
$x=3y-4$

5. Use Cramer's rule & solve:
$2x-y=9$
$5x-3y=14$

6. $x^2-4y^2=16$
$2y-x=2$

7. $3x+5y-2z=4$
$5x+2y-6z=2$
$4x+3y+3z=-19$

8. Graph the system of inequalities:

$x \leq 4$

$4x - y \geq 8$

$x + 2y \geq 2$

9. If 10 hot dogs and 5 soft drinks cost $12.50, while 7 hot dogs and 4 soft drinks cost $9.00, find the cost of a single hot dog and the cost of a single drink.

10. The product of two numbers is 6. The first number plus the square of the second is 7. Find all such numbers.

11. Find the equation whose roots are

$x = -3 \pm 5i$

12. Solve $x^3 - 3x^2 - 22x + 24 = 0$ given that $x+4$ is a factor.

13. Solve for x:
$x^4 - 4x^3 - 15x^2 + 58x - 40 = 0$

14. Graph $y = (x-2)(x+1)^2(x-3)^2$

15. Solve. Give interval notation.
$x^3 + 5x^2 - 6x \geq 0$

16. Solve. Give interval notation.
$\frac{9}{x} \leq x$

COLLEGE ALGEBRA EXAM 3A Solutions

1a) $\begin{vmatrix} 4 & -6 \\ 3 & 5 \end{vmatrix} = 20 - (-18) = 38$

b) $\begin{vmatrix} 4 & -6 \\ 0 & 1 \end{vmatrix} = 4 - 0 = 4$

2. $\begin{vmatrix} 5 & -2 & -3 \\ 6 & 1 & 4 \\ -1 & 9 & -8 \end{vmatrix} = 5\begin{vmatrix} 1 & 4 \\ 9 & -8 \end{vmatrix} - (-2)\begin{vmatrix} 6 & 4 \\ -1 & -8 \end{vmatrix} + (-3)\begin{vmatrix} 6 & 1 \\ -1 & 9 \end{vmatrix}$

$= 5(-8-36) + 2(-48+4) - 3(54+1)$

$= 5(-44) + 2(-44) - 3(55)$

$= -220 - 88 - 165 = -473$

3. $5(2x+4y=16)$
$4(3x-5y=-9)$

$10x+20y=80$
$12x-20y=-36$
$22x=44$
$x=2$

$4+4y=16$ (2,3)
$y=3$

4. $3x-5y=8$
$x=3y-4$

$3(3y-4)-5y=8$
$9y-12-5y=8$
$4y=20$
$y=5$ (11,5)
$x=15-4=11$

5. $2x-y=9$
$5x-3y=14$

$x=\dfrac{\begin{vmatrix} 9 & -1 \\ 14 & -3 \end{vmatrix}}{\begin{vmatrix} 2 & -1 \\ 5 & -3 \end{vmatrix}} = \dfrac{-27+14}{-6+5} = 13$

$y=\dfrac{\begin{vmatrix} 2 & 9 \\ 5 & 14 \end{vmatrix}}{\begin{vmatrix} 2 & -1 \\ 5 & -3 \end{vmatrix}} = \dfrac{28-45}{-6+5} = 17$

(13,17)

6. $x^2-4y^2=16$
$2y-x=2$
$x=2y-2$

$(2y-2)^2-4y^2=16$
$4y^2-8y+4-4y^2=16$
$-8y=12$
$y=-3/2$

$x=2(-3/2)-2=-5$

$(-5,-3/2)$

7. I $3x+5y-2z=4$
II $5x+2y-6z=2$
III $4x+3y+3z=-19$

-3I $-9x-15y+6z=-12$
II $5x+2y-6z=2$
$-4x-13y=-10$

III: $8x+6y+6z=-38$
$13x+8y=-36$

$13(-4x-13y=-10)$
$4(13x+8y=-36)$
$-52x-169y=-130$
$52x+32y=-144$
$-137y=-274$
$y=2$

$-4x-26=-10$
$-4x=16$
$x=-4$

$3x+5y-2z=4$ check:
$-12+10-2z=4$ $4x+3y+3z=-19$
$-2z=6$ $-16+6-9=-19$
$z=-3$ $-19=-19$ ✓

$(-4,2,-3)$

8. Left of $x=4$
Below $4x-y\le 8$ (x,y: 2,0)
Above $x+2y\ge 2$ (x,y: 0,1; 2,0)

9. $4(10h+5a=12.50)$
$-5(7h+4a=9.00)$

$40h+20a=50.00$
$-35h-20a=-45.00$
$5h=5$
$h=1$

$10+5a=12.50$
$5a=2.50$
$a=.50$

10. $xy=6$
$x+y^2=7$
$x=7-y^2$

$(7-y^2)y=6$
$-y^3+7y-6=0$
$y^3-7y+6=0$

1	1	0	-7	6
	↓	1	1	-6
	1	1	-6	0

$y^2+y-6=0$
$(y+3)(y-2)=0$
$y=1$ $y=-3$ $y=2$
$x=6$ $x=-2$ $x=3$

11. $x=-3\pm 5i$
$(x+3-5i)(x+3+5i)=0$
$(x+3)^2-25i^2=0$
$x^2+6x+9+25=0$
$x^2+6x+34=0$

12.

-4	1	-3	-22	24
	↓	-4	28	-24
	1	-7	6	0

$(x^2-7x+6)=0$
$(x-6)(x-1)=0$
$x=-4, x=6, x=1$

13.

1	1	-4	-15	58	-40
	↓	1	-3	-18	40
	1	-3	-18	40	0

2	1	-3	-18	40
	↓	2	-2	-40
	1	-1	-20	0

$x^2-x-20=0$
$(x-5)(x+4)=0$

$x=1, x=2, x=5, x=-4$

14. $y=(x-2)(x+1)^2(x-3)^2$
Roots: $x=2; x=-1; x=3$
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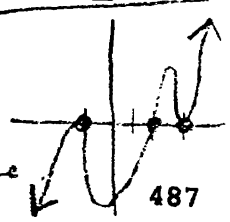


15. $x(x^2+5x-6)\ge 0$
$x(x+6)(x-1)\ge 0$
$x=0$ $x=-6$ $x=1$ endpts

F T F T
-6 0 1

$[-6,0]\cup[1,\infty)$

16. $\dfrac{9}{x}\le x$ $x=0$ endpt

$\dfrac{9}{x}=x$
$x^2=9$
$x=3,-3$ endpt

F T F T
-3 0 3

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

COLLEGE ALGEBRA EXAM 3 B R^1 NAME _____

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

1. Solve the systems of equations:

a) $7X + 5Y = -4$
$10X - 3Y = 45$

b) $Y = 2X - 9$
$5X - 3Y = 14$

2. Solve the system:

$2X - 5Y + 4Z = -35$
$5X + 3Y - Z = 1$
$X + Y + Z = 1$

3. Solve the system:

$X - Y = 1$
$Y - Z = 6$
$X + Z = -1$

4. Solve the system:

$X^2 + Y^2 = 50$
$Y = 2X + 5$

5. Solve the system:

$XY = 14$
$2X - Y = 3$

6. Evaluate the determinants:

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

7. Evaluate the determinant:

$$\begin{vmatrix} 6 & -4 & -5 \\ 2 & 7 & -3 \\ 0 & -9 & 8 \end{vmatrix}$$

8. Solve by Cramer's Rule:

$$\begin{aligned} 2X - Y &= 5 \\ X + 2Y &= 25 \end{aligned}$$

9. Graph the intersection:

$$\begin{aligned} X &\geq 0 \\ 2X - 3Y &\geq 12 \\ 7X + 4Y &\leq 28 \end{aligned}$$

10. Find the equation whose roots are: $X = -3 \pm 5i$

11. Solve for X:
$X^3 + 2X^2 - 5X - 6 = 0$

12. Sketch the graph of
$Y = (X-4)^3(X+3)^2(X-2)(X+1)^2$

13. Sketch the graph of
$Y = X^3 - 13X + 12$

14. The sum of two numbers is 18. Three times the first number plus twice the second number is 32. Find the numbers.

15. Eight hamburgers and six drinks cost \$21.50. If three burgers and seven drinks cost \$14.00, find the cost of each burger and drink.

COLLEGE ALGEBRA EXAM 3B Solutions

1a) $3(7x+5y=-4)$, $5(10x-3y=45)$

$21x+15y=-12$

$50x-15y=225$

$71x=213$

$x=3$

$21+5y=-4$

$5y=-25$

$y=-5$

$(3,-5)$

b) $y=2x-9$, $5x-3y=14$

$5x-3(2x-9)=14$

$5x-6x+27=14$

$-x=-13$

$x=13$

$y=2(13)-9$

$y=17$

$(13,17)$

2. I $2x-5y+4z=-35$; II $5x+3y-z=1$; III $x+y+z=1$

II + III: $6x+4y=2$

I: $2x-5y+4z=-35$

II: $20x+12y-4z=4$

$22x+7y=-31$

$-7(3x+2y=1)$

$2(22x+7y=-3)$

$-21x-14y=-7$

$44x+14y=-62$

$23x=-69$

$x=-3$

$3x+2y=1$

$-9+2y=1$

$2y=10$

$y=5$

$x+y+z=1$

$-3+5+z=1$

$z=-1$

$(-3,5,-1)$

Ch: $2x-5y+4z=-35$

$-6-25-4=-35$

3. I $x-y=1$; II $y-z=6$; III $x+z=-1$

II + III: $x+y=5$

$x-y=1$, $x+y=5$

$2x=6$

$x=3$

$3-y=1$

$y=2$

$y-z=6$

$2-z=6$

$z=-4$

$(3,2,-4)$

4. $x^2+y^2=50$, $y=2x+5$

$x^2+(2x+5)^2=50$

$x^2+4x^2+20x+25=50$

$5x^2+20x-25=0$

$5(x^2+4x-5)=0$

$5(x+5)(x-1)=0$

$x=-5 \quad x=1$

$y=2(x)+5$

$y=-5 \quad y=7$

$(-5,-5) \quad (1,7)$

5. $xy=14$, $2x-y=3$

$y=2x-3$

$x(2x-3)=14$

$2x^2-3x-14=0$

$(2x-7)(x+2)=0$

$x=7/2 \quad x=-2$

$y=2x-3$

$y=4 \quad y=-7$

$(7/2,4) \quad (-2,-7)$

6a) $\begin{vmatrix} 6 & -2 \\ -3 & 5 \end{vmatrix} = 30-6 = 24$

b) $\begin{vmatrix} -3 & 5 \\ 6 & -2 \end{vmatrix} = 6-30 = -24$

[NOTE: In #3, Cramer's Rule does not apply!]

7.
$$\begin{vmatrix} 6 & -4 & -5 \\ 2 & 7 & -3 \\ 0 & -9 & 8 \end{vmatrix} = 6\begin{vmatrix} 7 & -3 \\ -9 & 8 \end{vmatrix} - (-4)\begin{vmatrix} 2 & -3 \\ 0 & 8 \end{vmatrix} + (-5)\begin{vmatrix} 2 & 7 \\ 0 & -9 \end{vmatrix}$$
$$= 6(56-27)+4(16-0)-5(-18-0)$$
$$= 6(29)+64+90 = 328$$

8. $2x-y=5$, $x+2y=25$

$$x=\frac{\begin{vmatrix} 5 & -1 \\ 25 & 2 \end{vmatrix}}{\begin{vmatrix} 2 & -1 \\ 1 & 2 \end{vmatrix}} \qquad y=\frac{\begin{vmatrix} 2 & 5 \\ 1 & 25 \end{vmatrix}}{\begin{vmatrix} 2 & -1 \\ 1 & 2 \end{vmatrix}}$$

$x=\frac{35}{5}=7 \qquad y=\frac{45}{5}=9$

$(7,9)$

9. $x \geq 0 \quad x=0 \Rightarrow$ y-axis

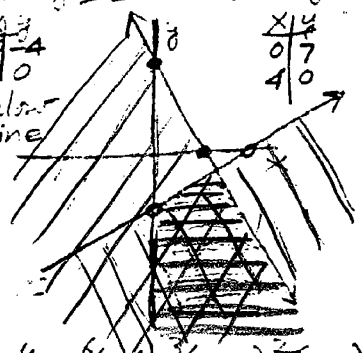
$2x-3y \geq 12$

x	y
0	−4
6	0

Below line

$7x+4y \leq 28$

x	y
0	7
4	0



10. $x=-3+5i$

$x=-3-5i$

$(x+3-5i)(x+3+5i)=0$

$(x+3)^2-25i^2=0$

$x^2+6x+9+25=0$

$x^2+6x+34=0$

11. $x^3+2x^2-5x-6=0$

$-1 \mid 1 \quad 2 \quad -5 \quad -6$

$\quad\quad\quad -1 \quad -1 \quad 6$

$\quad\quad 1 \quad 1 \quad -6 \quad 0$

$x^2+x-6=0$

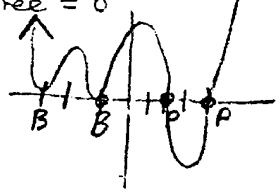
$(x+3)(x-2)=0$

$x=-1 \quad x=-3 \quad x=2$

12. $y=(x-4)^3(x+3)^2(x-2)(x+1)^2$

Degree = 8

Roots	Mult
$x=4$	odd (P)
$x=-3$	Even (B)
$x=2$	odd (P)
$x=-1$	even (B)



13. $y=x^3-13x+12$

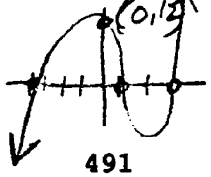
$1 \mid 1 \quad 0 \quad -13 \quad 12$

$\quad\quad\quad 1 \quad 1 \quad -12$

$\quad\quad 1 \quad 1 \quad -12 \quad 0$

$(x+4)(x-3)$

$x=-4 \quad x=3 \quad x=1$



14. $x+y=18$, $3x+2y=32$

$-2x-2y=-36$

$3x+2y=32$

$x=-4$

$x+y=18$

$-4+y=18$

$y=22$

15. $3(8h+6d=21.5)$

$-8(3h+7d=14.0)$

$24h+18d=64.50$

$-24h-56d=-112.00$

$-38d=-47.50$

$d=1.25$

$8h+6(1.25)=21.50$

$h=1.75$

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ANSWERS TO ALL EXERCISES ARE INCLUDED AT THE END OF THIS PAGE