

Hon Pre-Calculus Test Chapter 7 2017 - 2018

Show ALL Work For Full Credit!!! Circle All Final Answers!! Leave Any General Solutions In Terms Of Z!!!

Short Answer

1. Solve the given system.
$$\begin{cases} y = x^3 - 3x^2 + 4 \\ y = -2x + 4 \end{cases}$$

2. Solve the given system.
$$\begin{cases} 3x - 2y = 0 \\ x^2 - y^2 = 4 \end{cases}$$

3. Solve the give system.
$$\begin{cases} xy - 1 = 0 \\ 2x - 4y + 7 = 0 \end{cases}$$

4. What are the dimensions of a rectangular tract of land if its perimeter is 44 kilometers and its area is 120 square kilometers?

5. Solve the following system for u and v :
$$\begin{cases} v \tan 2x - u \sec 2x = 0 \\ u(-2 \cot 2x) + v(2 \sec 2x) = \tan 2x \end{cases}$$

6. Find the value of k and m so that the system is consistent dependent.

$$\begin{cases} 15x + 3y = m \\ -10x + ky = 9 \end{cases}$$

$$m = \underline{\hspace{2cm}}$$

$$k = \underline{\hspace{2cm}}$$

7. Solve the system.
$$\begin{cases} 5x - 3y + 2z = 3 \\ 2x + 4y - z = 7 \\ x - 11y + 4z = 3 \end{cases}$$

8. Solve the system.
$$\begin{cases} 3x - 3y + 6z = 6 \\ x + 2y - z = 5 \\ 5x - 8y + 13z = 7 \end{cases}$$

9. Solve the following system.
$$\begin{cases} x + 3w = 4 \\ 2y - z - w = 0 \\ 3y - 2w = 1 \\ 2x - y + 4z = 5 \end{cases}$$

10. In Super Bowl XLII, on February 1, 2009, the Pittsburgh Steelers defeated the Arizona Cardinals by a score of 27 to 23. The total points scored came from 15 different scoring plays, which were a combination of touchdowns, extra-point kicks, field goals, and safeties, worth 6, 1, 3, and 2 points respectively. There were three times as many touchdowns as field goals, and the number of extra-point kicks was equal to the number of touchdowns. How many field goals were scored during the game?

11. Write the partial fraction decomposition of:

$$\frac{x^2+x+2}{(x^2+2)^2}$$

13. Write the partial fraction decomposition of:

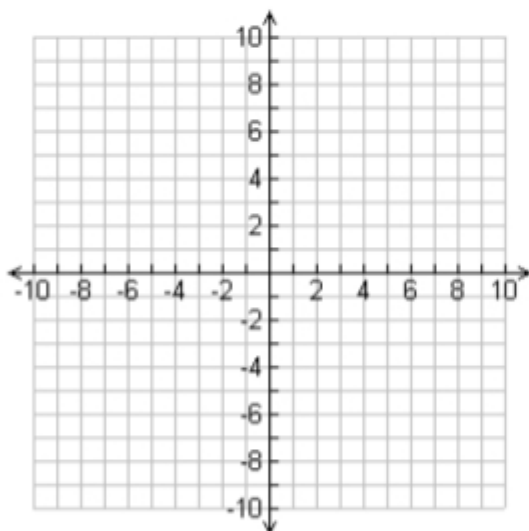
$$\frac{2x^4 + 8x^3 + 7x^2 - 7x - 12}{x^3 + 4x^2 + 4x}$$

12. Graph the system. $\begin{cases} x < 2y - y^2 \\ 0 < x + y \end{cases}$

14. Two concentric circles have radii x and y , where $y > x$. The area between the circles must be at least 16 square units.

a) Find a system of inequalities describing the constraints on the circles.

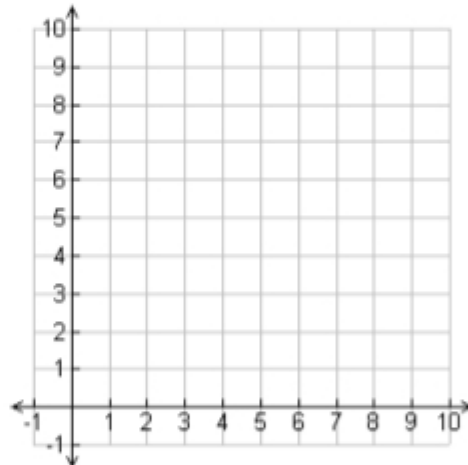
b) Graph the solution to the system:



15. A pet supply company makes two brands of dry dog food. Brand X costs \$15 per bag and contains 8 units of nutritional element A, 1 unit of nutritional element B, and 2 units of nutritional element C. Brand Y costs \$30 per bag and contains 2 units of nutritional element A, 1 unit of nutritional element B, and 7 units of nutritional element C. Each bag of mixed dog food must contain at least 16 units, 5 units and 20 units of nutritional elements A, B, C, respectively.

a) Write system of inequalities that models the constraints.

b) Graph the system of inequalities.



c) Write the objective function.

d) List all the vertices of the feasible region.

e) Find the number of bags of brand X and brand Y that should be mixed to produce a mixture meeting the minimum nutritional requirements and having an optimal cost.

f) What is the optimal cost?

Hon Pre-Calc Test Chapter 7

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Short Answer

1. Solve the given system. $\begin{cases} y = x^3 - 3x^2 + 4 \\ y = -2x + 4 \end{cases}$

$$\begin{aligned} x^3 - 3x^2 + 4 &= -2x + 4 & x^3 - 3x^2 + 4 &= 4 \\ x^3 - 3x^2 + 2x &= 0 & x^3 - 3x^2 + 4 &= 0 \\ x(x^2 - 3x + 2) &= 0 & x^3 - 3x^2 + 4 &= 0 \\ x(x-2)(x-1) &= 0 & x^3 - 3x^2 + 4 &= 0 \end{aligned}$$

$$x = 0, 2, 1$$

$$(0, 4), (1, 2), (2, 0)$$

2. Solve the given system. $\begin{cases} 3x - 2y = 0 \\ x^2 - y^2 = 4 \end{cases}$

$$3x = 2y$$

$$x = \frac{2}{3}y$$

$$\frac{4}{9}y^2 - y^2 = 4$$

$$-\frac{5}{9}y^2 = 4$$

No Solution

3. Solve the given system. $\begin{cases} xy - 1 = 0 \\ 2x - 4y + 7 = 0 \end{cases}$

$$2x = 4y - 7$$

$$x = 2y - \frac{7}{2}$$

$$x(-\frac{1}{4}) = 1$$

$$x = -4$$

$$2y^2 - 7y - 1 = 0$$

$$x(2) = 1$$

$$4y^2 - 7y - 2 = 0$$

$$x = \frac{1}{2}$$

$$(4y+1)(y-2) = 0$$

$$(-4, -\frac{1}{4})$$

$$y = -\frac{1}{4}, 2$$

$$(\frac{1}{2}, 2)$$

4. What are the dimensions of a rectangular tract of land if its perimeter is 44 kilometers and its area is 120 square kilometers?

$$2(L+W) = 44$$

$$LW = 120$$

$$L = 22 - W$$

$$W = 10, 12$$

$$(22-W)(W) = 120$$

$$-W^2 + 22W = 120$$

$$W^2 - 22W + 120 = 0$$

$$(W-10)(W-12) = 0$$

5. Solve the following system for u and v :

$$\begin{cases} v \tan 2x - u \sec 2x = 0 \\ u(-2 \cot 2x) + v(2 \sec 2x) = \tan 2x \end{cases}$$

$$v \tan 2x = u \sec 2x$$

$$v = u \csc 2x$$

$$u(-2 \cot 2x) + u \csc 2x (2 \sec 2x) = \tan 2x$$

$$2u \left(-\frac{\cos 2x}{\sin 2x} + \frac{1}{\sin 2x \cos 2x} \right) = \tan 2x$$

$$2u \left(\frac{\sin^2 2x}{\sin 2x \cos 2x} \right) = \frac{\sin 2x}{\cos 2x}$$

$$2u = \frac{\sin 2x}{\cos 2x} \cdot \frac{\sin 2x \cos 2x}{\sin^2 2x}$$

$$2u = 1$$

$$u = \frac{1}{2}$$

$$v = \frac{1}{2} \csc 2x$$

$$\left(\frac{1}{2}, \frac{1}{2} \csc 2x \right)$$

6. Find the value of k and m so that the system is consistent dependent.

$$\begin{cases} 15x + 3y = m \\ -10x + ky = 9 \end{cases}$$

$$15:3 = 5:1$$

$$m = -\frac{27}{5} = -5.4$$

$$m = -\frac{27}{5}$$

$$m = -\frac{27}{5}$$

$$k = -2$$

7. Solve the system.

$$\begin{cases} 5x - 3y + 2z = 3 \\ 2x + 4y - z = 7 \\ x - 11y + 4z = 3 \end{cases}$$

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

$$4x + 8y - 7z = 14$$

$$9x + 5y = 17$$

$$x - 11y + 4z = 3$$

$$8x + 11y - 4z = 28$$

$$9x + 5y = 31$$

No solution

8. Solve the system.

$$\begin{cases} 3x - 3y + 6z = 6 \\ x + 2y - z = 5 \\ 5x - 8y + 13z = 7 \end{cases}$$

$$x - y + 2z = 2$$

$$x + 11y - 2z = 5$$

$$-3y + 3z = -3$$

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

$$5x - 8y + 13z = 7$$

$$-18y + 18z = -18$$

$$x + 2z + 2z = 5$$

$$x = -2 + 3$$

$$-3y = -3z - 3$$

$$y = z + 1$$

$$(-2 + 3, z + 1, z)$$

9. Solve the following system:

$$\begin{cases} x + 3w = 4 \\ 2y - z - w = 0 \\ 3y - 2w = 1 \\ 2x - y + 4z = 5 \\ 2x + 6w = 8 \end{cases}$$

$$2y - z - w = 0$$

$$-2y + 13z - 11w = -6$$

$$7z - 13w = -6$$

$$5z - 6w = -2$$

$$21z - 39w = -18$$

$$21z - 35w = -14$$

$$-4w = -4$$

$$w = 1$$

$$(1, 1, 1, 1)$$

$$x + 3w = 4$$

$$2y - z - w = 0$$

$$3y - 2w = 1$$

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

$$2x + 6w = 8$$

$$-6w - y + 4z = -3$$

$$3z - 5 = -2$$

$$3z = 3$$

$$z = 1$$

$$x + 3 = 4$$

$$x = 1$$

$$3z - 2 = 1$$

$$3z = 3$$

$$z = 1$$

10. In Super Bowl XLII, on February 1, 2009, the Pittsburgh Steelers defeated the Arizona Cardinals by a score of 27 to 23. The total points scored came from 15 different scoring plays, which were a combination of touchdowns, extra-point kicks, field goals, and safeties, worth 6, 1, 3, and 2 points respectively. There were three times as many touchdowns as field goals, and the number of extra-point kicks was equal to the number of touchdowns. How many field goals were scored during the game?

$$t + e + f + s = 15$$

$$6t + e + 3f + 2s = 27 + 23 = 50$$

$$t = 3f$$

$$e = t$$

$$3f + 3f + f + s = 15 \rightarrow 7f + s = 15$$

$$18f + 3f + 3f + 2s = 50 \rightarrow 24f + 2s = 50$$

$$7f + s = 15$$

$$17f + s = 25$$

$$5f = 10$$

$$f = 2$$

2 field goals

$$\frac{x^2+x+2}{(x^2+2)^2} = \frac{Ax+B}{x^2+2} + \frac{Cx+D}{(x^2+2)^2}$$

$$x^2+x+2 = (Ax+B)(x^2+2) + (Cx+D)$$

$$A=0 \quad Cx+2Ax=x$$

$$0x^2=x^2 \quad (x=x)$$

$$B=1 \quad C=1$$

$$0+18=2$$

$$0+2=2$$

$$0=0$$

$$\frac{x^2+x+2}{(x^2+2)^2} = \frac{1}{x^2+2} + \frac{x}{(x^2+2)^2}$$

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11. Write the partial fraction decomposition of:

$$\frac{x^2+x+2}{(x^2+2)^2} = \frac{Ax+B}{x^2+2} + \frac{Cx+D}{(x^2+2)^2}$$

$$\frac{-x-2}{(x^2+2)} = \frac{Ax+B}{x^2+2} + \frac{Cx+D}{(x^2+2)^2}$$

$$-x-2 = (Ax+B)(x^2+2) + (Cx+D)$$

$$Ax^3+Bx^2+Cx+D = -x-2$$

$$A=0 \quad B=0$$

$$C=0 \quad D=0$$

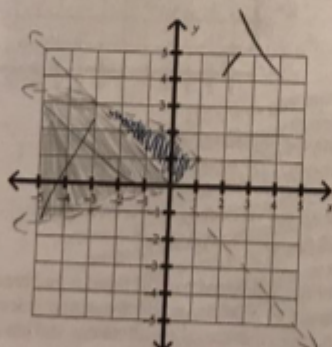
$$C(x+2) = -1 \quad 2(0)+0 = -2$$

$$C = -1 \quad D = -2$$

$$\frac{x^2+x+2}{(x^2+2)^2} = \frac{x^2-x+3}{(x^2+2)^2} + \frac{-x-2}{(x^2+2)^2}$$

12. Graph the system.

$$\begin{cases} x < 2y - y^2 \\ 0 < x + y \end{cases}$$



13. Write the partial fraction decomposition of:

$$\frac{2x^4+8x^3+7x^2-7x-12}{x^3+4x^2+4x} = 2x + \frac{-3}{x} + \frac{2}{x+2} + \frac{1}{(x+2)^2}$$

$$\frac{2x^4+8x^3+7x^2-7x-12}{x^3+4x^2+4x} = 2x + \frac{-3}{x} + \frac{2}{x+2} + \frac{1}{(x+2)^2}$$

$$\frac{-x^2-7x-12}{x^3+4x^2+4x} = \frac{A}{x} + \frac{B}{x+2} + \frac{C}{(x+2)^2}$$

$$-x^2-7x-12 = A(x+2)^2 + B(x)(x+2) + C(x)$$

$$-2C = -4 + 14 - 12$$

$$-2C = -2$$

$$C = 1$$

$$Ax^2+Bx^2 = -x^2$$

$$4A = -12$$

$$A = -3$$

$$-5+B = -1$$

$$B = 2$$

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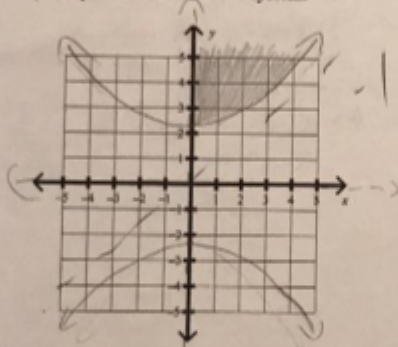
14. Two concentric circles have radii x and y , where $y > x$. The area between the circles must be at least 16 square units.

a) Find a system of inequalities describing the constraints on the circles.

$$\begin{cases} \pi y^2 - \pi x^2 \geq 16 \\ x > 0 \\ y > 0 \end{cases}$$

(Handwritten note: $y > x$)

b) Graph the solution to the system:



$$\sqrt{\frac{16}{\pi}} \approx 2.26$$

$$C = 15(0) + 30(8) = \$240$$

$$C = 15(1) + 30(4) = \$135$$

$$C = 15(3) + 30(2) = \$105$$

$$C = 15(10) + 30(0) = \$150$$

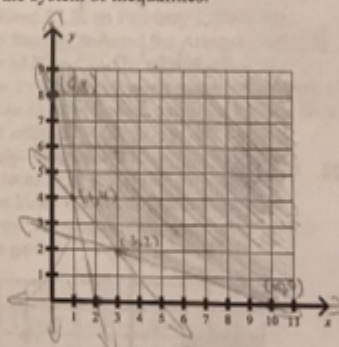
	A	B	C
X	8	1	2
Y	2	1	7

15. A pet supply company makes two brands of dry dog food. Brand X costs \$15 per bag and contains 8 units of nutritional element A, 1 unit of nutritional element B, and 2 units of nutritional element C. Brand Y costs \$30 per bag and contains 2 units of nutritional element A, 1 unit of nutritional element B, and 7 units of nutritional element C. Each bag of mixed dog food must contain at least 16 units, 5 units, and 20 units of nutritional elements A, B, and C, respectively.

a) Write system of inequalities that models the constraints.

$$\begin{cases} 8x + 2y \geq 16 \\ x + y \geq 5 \\ 2x + 7y \geq 20 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

b) Graph the system of inequalities.



c) Write the objective function.

$$C = 15x + 30y$$

d) List all the vertices of the feasible region.

$$(0, 8), (1, 4), (3, 2), (10, 0)$$

e) Find the number of bags of brand X and brand Y that should be mixed to produce a mixture meeting the minimum nutritional requirements and having an optimal cost.

3 bags of brand X

2 bags of brand Y

f) What is the optimal cost?

$$C = 15(3) + 30(2)$$

$$= \$105$$

(Handwritten note: 2)

