Algebra 2 Fall Semester Final Exam Study Guide - Chapter 3 and 4 (Part 2)

Name: KEY

3.1: Solving Systems of Equations

1) $-5x - y = 12$
$+\ 7x + y = -16$
$2x = -4$
$\boxed{x = -2}$

$-14 + y = -16$
$\boxed{y = -2}$

2) $3x - 2y = -4$
$+\ -x + 2y = 4$
$2x = -8$
$\boxed{x = -4}$

$3(-4) - 2y = -4$
$-2y = 8$
$\boxed{y = -4}$

$3(-9x + 10y = -22)\ 8$ → $-72x + 80y = -176$
$(-7x - 8y = -18)\ 10$ → $-70x - 80y = -180$
$-142x = -356$
$\boxed{x = 2.5}$

$-7(2.5) - 8y = -18$
$-8y = -0.5$
$\boxed{y = .0625}$

4) Andre and Paul each mow lawns. Andre charges a $30 service fee and $10 per hour. Paul charges a $10 service fee and $15 per hour. After how many hours will Andre charge the same amount? Write a system of equations to represent this situation.

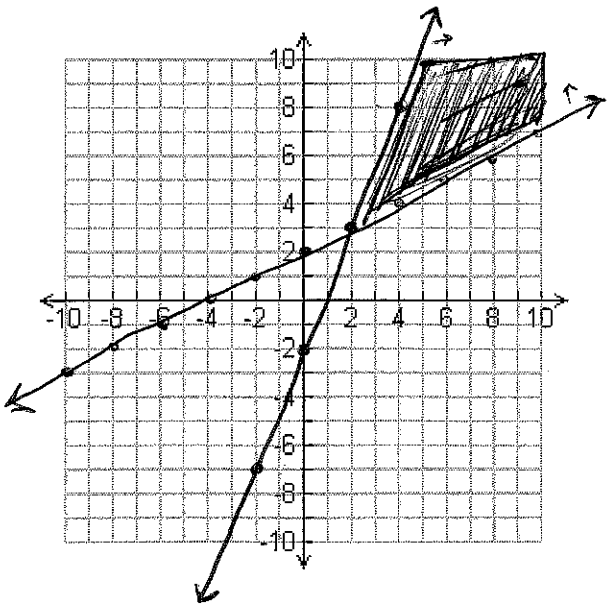
x = # of hours
y = total amount charged

$\boxed{\begin{array}{l} 30 + 10x = y \\ 10 + 15x = y \end{array}}$ → $30 + 10x = y$
$-10 + -15x = -y$
$20 + -5x = 0$
$\boxed{x = 4}$

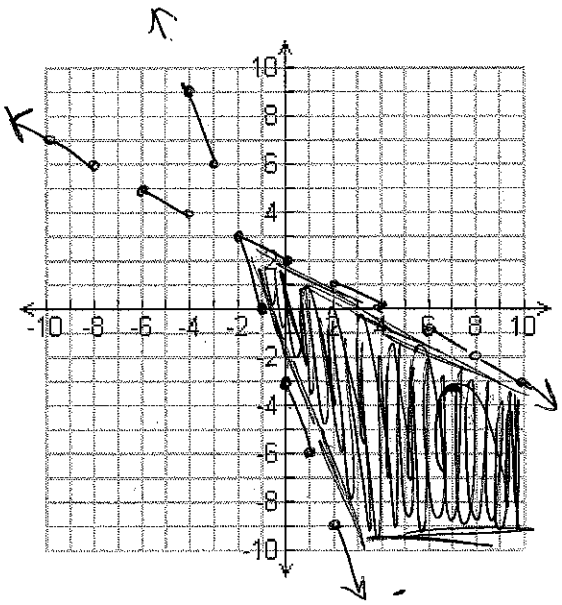
$30 + 10(4) = y$
$30 + 40 = y$
$\boxed{70 = y}$

3.2: Solving Systems of inequalities by Graphing

5)
$y \le \frac{5}{2}x - 2$ $\quad 0 \le -2$ ⊗
$y \ge \frac{1}{2}x + 2$ $\quad 0 \ge 2$ ⊗



6)
$3x + y > -3$ → $y > -3x - 3$ $\quad 0 > -3$ ✓
$x + 2y < 4$ → $y < -\frac{1}{2}x + 2$ $\quad 0 < 2$ ✓



3.5: Operations with Matrices

Perform the indicated operations. If the matrix does not exist, write impossible.

8) $\begin{bmatrix} 2 \\ -6 \end{bmatrix} - \begin{bmatrix} -3 \\ 2 \end{bmatrix} + \begin{bmatrix} 6 \\ 0 \end{bmatrix}$

$\boxed{\begin{bmatrix} 11 \\ -8 \end{bmatrix}}$

9) $3\left(\begin{bmatrix} -2 & 0 \\ 6 & 8 \end{bmatrix} + \begin{bmatrix} 1 & 9 \\ -3 & -4 \end{bmatrix}\right)$

$\boxed{\begin{bmatrix} -3 & 27 \\ 9 & 12 \end{bmatrix}}$

10) $-3\begin{bmatrix} 4a \\ 0 \\ -3 \end{bmatrix} + 4\begin{bmatrix} -2 \\ 3 \\ -1 \end{bmatrix}$ $\boxed{\begin{bmatrix} -12a-8 \\ 12 \\ 5 \end{bmatrix}}$

11) $\begin{bmatrix} -5 & 7 \\ 6 & 8 \end{bmatrix} - \begin{bmatrix} 4 & 0 & -2 \\ 9 & 0 & 1 \end{bmatrix}$

$\boxed{\text{Not possible}}$

3.6: Multiplying Matrices

Find each product, if possible.

11) $\begin{bmatrix} 3 & -7 \end{bmatrix} \cdot \begin{bmatrix} 9 \\ -5 \end{bmatrix}$

$\boxed{\begin{bmatrix} 62 \end{bmatrix}}$

12) $\begin{bmatrix} -3 & 0 & 2 \\ 6 & -1 & 5 \end{bmatrix} \cdot \begin{bmatrix} 8 & -1 \\ -4 & 3 \\ 6 & 7 \end{bmatrix}$

$\boxed{\begin{bmatrix} -12 & 17 \\ 82 & 26 \end{bmatrix}}$

13) $\begin{bmatrix} 2 & 11 \\ 0 & -3 \\ -6 & 7 \end{bmatrix} \cdot \begin{bmatrix} 0 & 8 & -5 \\ 12 & 0 & 9 \\ 4 & -6 & 7 \end{bmatrix}$

$\boxed{\text{Not possible}}$

14) $\begin{bmatrix} 2 & 0 \\ -3 & 5 \\ 1 & 4 \end{bmatrix} \cdot \begin{bmatrix} 3 \\ -2 \end{bmatrix}$ $\boxed{\begin{bmatrix} 6 \\ -19 \\ -5 \end{bmatrix}}$

3.8 [redacted]: Solving Systems of Equations using Inverse Matrices

Find the inverse of each matrix, if it exists.

15) $\begin{bmatrix} 7 & 4 \\ 3 & 2 \end{bmatrix}$ $\boxed{\begin{bmatrix} 1 & -2 \\ -1.5 & 3.5 \end{bmatrix}}$

16) $\begin{bmatrix} 2 & 5 \\ -5 & -13 \end{bmatrix}$ $\boxed{\begin{bmatrix} 13 & 5 \\ -5 & -2 \end{bmatrix}}$

17) $\begin{bmatrix} 6 & -3 \\ -8 & 4 \end{bmatrix}$ $\boxed{\emptyset}$

Use inverse matrices to solve the following system of equations.

18) $5x + 3y = 4$
$3x + 2y = 0$

$\begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}^{-1} \cdot \begin{bmatrix} 4 \\ 0 \end{bmatrix} = \boxed{\begin{matrix} x = 8 \\ y = -12 \end{matrix}}$

19) $3a - b = 5$
$a + 2b = 4$

$\begin{bmatrix} 3 & -1 \\ 1 & 2 \end{bmatrix}^{-1} \cdot \begin{bmatrix} 5 \\ 4 \end{bmatrix}$ $\boxed{\begin{matrix} a = 2 \\ b = 1 \end{matrix}}$

Section 4.1 - Graphing Quadratic Functions $x = -b/2a$

For #1-4, find the y-intercept, the equation for the axis of symmetry, and the coordinates for the vertex. $\left(-b/2a,\ f\left(\frac{-b}{2a}\right)\right)$

c

1) $f(x) = 2x^2 + 10x + 24$

y-int: $\boxed{24}$

AoS: $x = \frac{-10}{2 \cdot 2} = \frac{-5}{2} = \boxed{-2.5}$

Vertex: $\boxed{(-2.5, 11.5)}$

2) $f(x) = 6x^2 - 14x + 30$

y-int: $\boxed{30}$

AoS: $x = \frac{14}{2 \cdot 6} = \frac{14}{12}$ $\boxed{x = 1.167}$

vertex: $\boxed{(1.167, 21.83)}$

3) $f(x) = -2x^2 + 6x - 2$

y-int: $\boxed{-2}$

AoS: $x = -6/2 \cdot -2 = \frac{-6}{-4} = \boxed{1.5}$

vertex: $\boxed{(1.5, 2.5)}$

4) $f(x) = -6x^2 + 24x - 2$

y-int: $\boxed{-2}$

AoS: $x = \frac{-24}{-12} = \boxed{2}$

vertex: $\boxed{(2, 22)}$

$-6(2)^2 + 24(2) - 2$

$-24 + 48 - 2$

22

Determine whether each function has a maximum or a minimum. Then, find the maximum/minimum value. → vertex!

$a < 0$ $a > 0$

5) $f(x) = -x^2 + 3x - 1$ $x = -3/-2 = 1.5$

$\boxed{\text{Maximum } (1.5, 1.25)}$

6) $f(x) = -3x^2 - 4x + 5$ $x = \frac{4}{2 \cdot -3} = \frac{4}{-6}$

$\boxed{\text{Maximum } (-0.67, 9.0267)}$

Section 4.2 - Solving Quadratic Equations by Graphing

Solve each equation by graphing. (hint: press 2ND, TRACE, to find the exact values for the zeros that are between two numbers!)

7) $x^2 - x - 20 = 0$

$\boxed{x = 5,\ x = -4}$

8) $4x^2 - 6x - 15 = 0$

$\boxed{x = -1.33,\ x = 2.83}$

Section 4.4 - Complex Numbers

Simplify.

11) $\sqrt{-8}$

$\sqrt{-1} \cdot \sqrt{8}$

$i \cdot \sqrt{4} \cdot \sqrt{2}$

$\boxed{2i\sqrt{2}}$

12) $(2 - i) + (13 + 4i)$

$\boxed{15 + 3i}$

13) $(6 + 2i) - (4 - 3i)$

$\boxed{2 + 5i}$

14) $(6 + 5i)(3 - 2i)$

$18 - 12i + 15i - 10i^2$

$18 + 3i + 10$

$\boxed{28 + 3i}$

15) $(-10 - 4i)(3 - 2i)$

$-30 + 20i - 12i + 8i^2$

$-30 + 8i - 8$

$\boxed{-38 + 8i}$

Section 4.5 - Completing the Square $c = \left(\frac{b}{2}\right)^2$

Find the value of c that makes each trinomial a perfect square. Then, write the trinomial as a perfect square.

16) $x^2 + 18x + c$

$\left(\frac{18}{2}\right)^2 = c$

$81 = c$

$x^2 + 18x + 81$

17) $x^2 - 4x + c$

$\left(\frac{-4}{2}\right)^2 = c$

$4 = c$

$x^2 - 4x + 4$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Section 4.6 - The Quadratic Formula and the Discriminant

For #22-24, Find the value of the discriminant, describe the number and type of roots, and find the solutions by using the quadratic formula. $b^2 - 4ac$

20) $x^2 - 2x + 9 = 0$

$(-2)^2 - 4(1)(9)$

-32

2 complex solutions

$x = \frac{2 \pm \sqrt{-32}}{2}$

21) $2x^2 + 19x - 33 = 0$

$361 - 4(2)(-33)$

625

2 real solutions

$x = 1.5$

$x = -11$

$\frac{-19 \pm 25}{4}$

22) $x^2 - 10x + 25 = 0$

$100 - 4(1)(25)$

0

1 real solution

$x = -5$

Solve each equation by factoring, the quadratic formula, or completing the square.

9) $2x^2 - 2x - 24 = 0$

-48

-8 6

-2

	x	3
$2x$	$2x^2$	$6x$
-8	$-8x$	-24

$(x+3)(2x-8) = 0$

$x = -3 \quad x = 4$

10) $2x^2 - 5x - 3 = 0$

$\frac{5 \pm \sqrt{25 - 4(2)(-3)}}{2 \cdot 2}$

$\frac{5 \pm \sqrt{49}}{4} = \frac{5 \pm 7}{4}$

$x = 3$

$x = -1/2$