MAT 102 FALL 2011

TEST 2 GUIDE

THIS IS PAGE 1, FOLLOWING PAGE NUMBERS AT CENTER-TOP

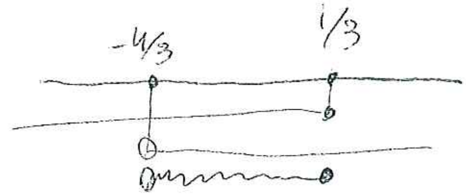
9. Give the solution in interval notation for the inequality $2x + 1 \leq 5x - 2$.

$$\begin{array}{rcl} 2x + 1 & \leq & 5x - 2 \\ -5x - 1 & & -5x - 1 \end{array} \rightarrow \frac{-3x}{-3} \leq \frac{-3}{-3} \rightarrow x \geq 1$$

SWITCH

SOLUTION: $[1, +\infty)$

10. Solve the double inequality $1 \leq 2 - 3x < 6$.



$$\begin{array}{ccccc} 1 & \leq & 2 - 3x & < & 6 \\ -2 & & -2 & & -2 \end{array}$$

$$\frac{-1}{-3} \leq \frac{-3x}{-3} < \frac{4}{-3} \rightarrow \frac{1}{3} \geq x > -\frac{4}{3}$$

SWITCH

IN INTERVAL NOTATION: $\left(-\frac{4}{3}, \frac{1}{3}\right]$

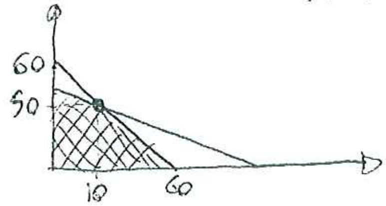
5. You organize a party with a budget of \$560. For each guest under 16 years you pay \$6 and for each other guest you pay \$10. Without counting yourself, the facility can old only 60 guests.

(a) Set up a system of linear inequality describing the constraints for your party.

(b) List three possible combinations of guests based on their age.

X = # YOUNG GUESTS
Y = # ADULT GUESTS

a) $\begin{cases} \text{COST} \to 6X + 10Y \le 560 \\ \text{SPACE} \to X + Y \le 60 \end{cases}$



b) $(60, 0), (10, 50), (8, 51)$

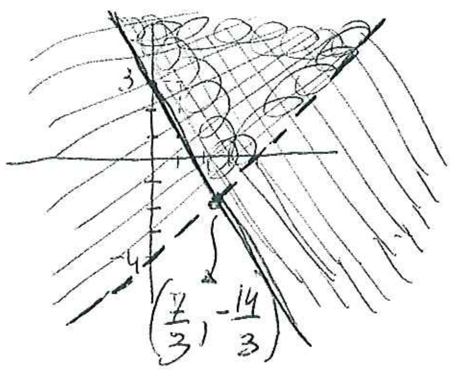
$\to$ CHECK : $\begin{cases} 8 + 51 \le 60 \ \checkmark \\ 6(8) + 10(51) = 558 \le 560 \ \checkmark \end{cases}$

6. Graph the solution set of the following system of linear inequalities, labeling the corner point and highlighting the contour.

$$\begin{cases} 2x & +y & \ge 3 \\ x & -y & < 4 \end{cases}$$

SOLVE FOR Y $\to \begin{cases} Y \ge -2X + 3 \\ \frac{-Y}{-1} < \frac{-X + 4}{-1} \to Y > X - 4 \end{cases}$

TURNS AROUND



BOUNDARY LINES $\begin{cases} Y = -2X + 3 \\ Y = X - 4 \end{cases} \to X - 4 = -2X + 3 \to 3X = 7 \to X = \frac{7}{3} \to$

$\to Y = \frac{7}{3} - 4 = -\frac{14}{3}$

9. Give the solution in interval notation for the inequality $2x + 3 \le 4x - 6$.

$$\begin{array}{l} 2X + 3 \le 4X - 6 \\ -4X - 3 \quad -4X - 3 \end{array} \to \frac{-2X}{-2} \le \frac{-9}{-2} \to X \ge \frac{9}{2}$$

WE CAN HAVE $X = 9/2$

$\frac{9}{2}$

THE SOLUTION IS THE INTERVAL $\left[\frac{9}{2}, +\infty\right)$

10. Solve the double inequality $5x + 2 \le -4$ and $3x - 4 > 5$.

SINCE WE HAVE "AND", WE MUST CONSIDER THE OVERLAPPING OF THE SOLUTION OF EACH INEQUALITY

I) $\underset{-2}{5X + 2} \le \underset{-2}{-4} \to 5X \le -6 \to X \le -\frac{6}{5}$

$-6/5 \quad 3$

II) $\underset{+4}{3X - 4} > \underset{+4}{5} \to \frac{3X}{3} > \frac{9}{3} \to X > 3$

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THEY DO NOT OVERLAP!

THERE IS NOT SOLUTION TO THIS DOUBLE INEQUALITY.

4. (15 points) A bank loans \$285,000 to a development company to purchase three business properties. One of the properties costs \$45,000 more than the other and the third costs twice the sum of these two properties.

(a) Write the system of linear equations relating the costs of these properties.

SAY X, Y, AND Z ARE THESE COSTS IN THOUSAND DOLLARS, THEN:

$$\begin{array}{ll} \text{EQ1:} & \left\{ \begin{array}{l} X+Y+Z=285 \\ X=Y+45 \\ Z=2(X+Y) \end{array} \right. \\ \text{EQ2:} & \\ \text{EQ3:} & \end{array}$$

(b) Find the cost of each property.

I USE SUBSTITUTION:

PLUG EQ2 IN EQ3: $Z=2(Y+45+Y) \to Z=2(2Y+45)$

PLUG THIS AND EQ2 IN EQ1: $(Y+45)+Y+2(2Y+45)=285 \to$

$\to Y+\underset{-135}{45}+Y+4Y+\underset{-135}{90}=285 \to 6Y=150 \to Y=\frac{150}{6}=25$

NOW: $Z=2(2Y+45)=2(2\cdot 25+45)=2\cdot 95=190$

$X=Y+45=25+45=70$

THE PRICES ARE \$190,000, \$25,000, AND \$70,000.

NOTE: ONE CAN USE THE CALCULATOR AND RREF

AFTER REWRITING THE SYSTEM IN STANDARD FORM:

$$\left\{ \begin{array}{l} X+Y+Z=285 \\ X-Y=45 \\ 2X+2Y-Z=0 \end{array} \right.$$

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5. Solve the following systems of linear equations.

(a) (11 points) $\begin{cases} x - 2y + z - 3w = 10 \\ 2x - 3y + 4z + w = 12 \\ 2x - 3y + z - 4w = 7 \\ x - y + z + w = 4 \end{cases}$

MATRIX: $\left[\begin{array}{cccc|c} 1 & -2 & 1 & -3 & 10 \\ 2 & -3 & 4 & 1 & 12 \\ 2 & -3 & 1 & -4 & 7 \\ 1 & -1 & 1 & 1 & 4 \end{array}\right] \xrightarrow{\text{RREF}} \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -57 \\ 0 & 1 & 0 & 0 & -70 \\ 0 & 0 & 1 & 0 & -25 \\ 0 & 0 & 0 & 1 & 16 \end{array}\right]$

SOLUTION: $(X, Y, Z, W) = (-57, -70, -25, 16)$

(b) (11 points) $\begin{cases} 2x + 3y + 4z = 5 \\ x + y + z = 1 \\ 6x + 7y + 8z = 9 \end{cases}$

$\text{RREF}\left(\left[\begin{array}{ccc|c} 2 & 3 & 4 & 5 \\ 1 & 1 & 1 & 1 \\ 6 & 7 & 8 & 9 \end{array}\right]\right) = \left[\begin{array}{ccc|c} 1 & 0 & -1 & -2 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 \end{array}\right] \rightarrow \begin{cases} X - Z = -2 \\ Y + 2Z = 3 \\ Z = Z \end{cases}$

$\boxed{\begin{aligned} X &= Z - 2 \\ Y &= 3 - 2Z \\ Z &= Z \end{aligned}}$ SOLUTION

(INFINITELY MANY SOLUTIONS)

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5. Solve the following systems of linear equations.

(a) (11 points) $\begin{cases} x + y - z - 4w = 6 \\ 3x - 4y + z + 2w = 5 \\ 5x + 2y + 6z - 3w = 1 \\ x \quad - 3z \quad = 4 \end{cases}$

$$A = \left[\begin{array}{cccc|c} 1 & 1 & -1 & -4 & 6 \\ 3 & -4 & 1 & 2 & 5 \\ 5 & 2 & 6 & -3 & 1 \\ 1 & 0 & -3 & 0 & 4 \end{array}\right], \quad RREF(A) = \left[\begin{array}{ccccc} 1 & 0 & 0 & 0 & 361/328 \\ 0 & 1 & 0 & 0 & -217/164 \\ 0 & 0 & 1 & 0 & -317/328 \\ 0 & 0 & 0 & 1 & -431/328 \end{array}\right]$$

THEREFORE:

$$\begin{cases} X = 361/328 \approx 1.1 \\ Y = -217/164 \approx -1.32 \\ Z = -317/328 \approx -.97 \\ W = -431/328 \approx -1.31 \end{cases}$$

(b) (11 points) $\begin{cases} x - 3y + 2z = 12 \\ 2x - 6y + z = 7 \end{cases}$

$$A = \left[\begin{array}{ccc|c} 1 & -3 & 2 & 12 \\ 2 & -6 & 1 & 7 \end{array}\right], \quad RREF(A) = \left[\begin{array}{cccc} 1 & -3 & 0 & 2/3 \\ 0 & 0 & 1 & 17/3 \end{array}\right]$$

$2/3 \approx .7$

$17/3 \approx 5.7$

THEREFORE

$$\begin{cases} X - 3Y = 2/3 \\ Z = 17/3 \end{cases} \longrightarrow \begin{cases} X = 3Y + 2/3 \\ Y = Y \\ Z = 17/3 \end{cases}$$

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4. (15 points) You figure out a new diet, taking in account three food kinds, dairy, meat, and vegetables. Dairy products considered contain 4 calories per gram. Vegetables considered contain 1 calory per gram. Meat considered contain 8 calories per gram. You want a daily intake of 2000 calories, with exactly 500 grams of daily food given by dairy and vegetables. Moreover, you always want the serving size of vegetable to be the same as the sum of the serving sizes of meat and dairy. Let d, m, and v, measured in grams, be the serving sizes of respectively dairy, meat, and vegetables. Write a system of equations modeling your diet.

WE NEED (OR IT IS BETTER) TO USE A QUANTITY/RATE TABLE. HERE THE QUANTITIES ARE IN GRAMS, WHILE THE RATES ARE THE CALORIES.

	Q	R	Q·R
DAIRY	d	4	$4d$
MEAT	m	8	$8m$
VEGETABLES	v	1	$1v$
TOTALS	$d+m+v$		$4d+8m+v$

DAILY CALORIES INTAKE

TOTAL QUANTITIES IN GRAMS

$d+m+v=$ UNKNOWN !

$$\begin{cases} 4d+8m+v = 2000 \text{ (CAL)} \\ d+v=500 \text{ (gr)} \\ v=d+m \end{cases}$$

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5. Solve the following systems of linear equations. When using a calculator, write the augmented matrix of the system and the corresponding reduced row echelon form.

(a) (11 points) $\begin{cases} 4x + 3y + 2z - w = 3 \\ -x + w = -1 \\ x + 2y - 3z + 6w = 4 \\ 2x - 3y = 2 \end{cases}$

$$A = \begin{bmatrix} 4 & 3 & 2 & -1 & 3 \\ -1 & 0 & 0 & 1 & -1 \\ 1 & 2 & -3 & 6 & 4 \\ 2 & -3 & 0 & 0 & 2 \end{bmatrix}, \quad RREF(A) = \begin{bmatrix} 1 & 0 & 0 & 0 & 104/95 \\ 0 & 1 & 0 & 0 & 6/95 \\ 0 & 0 & 1 & 0 & -14/19 \\ 0 & 0 & 0 & 1 & 9/95 \end{bmatrix}$$

SOLUTION: $\begin{cases} X = 104/95 \approx 1.09 \\ Y = 6/95 \approx .06 \\ Z = -14/19 \approx -.74 \\ W = 9/95 \approx .09 \end{cases}$

(b) (11 points) $\begin{cases} 3y + z = 10 \\ x - 6y = 4 \end{cases}$

$$A = \begin{bmatrix} 0 & 3 & 1 & 10 \\ 1 & -6 & 0 & 4 \end{bmatrix}, \quad RREF(A) = \begin{bmatrix} 1 & 0 & 2 & 24 \\ 0 & 1 & 1/3 & 10/3 \end{bmatrix}$$

SOLUTION: $\begin{cases} X + 2Z = 24 \\ Y + 1/3 Z = 10/3 \end{cases} \rightarrow \begin{cases} X = -2Z + 24 \\ Y = -1/3 Z + 10/3 \\ Z = Z \end{cases}$

NOTE THAT FROM THE INITIAL EQUATIONS WE GET: $\begin{cases} X = 6Y + 4 \\ Y = Y \\ Z = -3Y + 10 \end{cases}$

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8. (15 points) You found a bag of dollar bills and you return it to the police. Later on, an officer tells you that the bag contained three kinds of bills: an O amount of \$1 bills, a T amount of \$10 bills, and a H amount of \$100 bills. The bag contained 175 bills worth \$5350, and twice as many \$1 bills as \$100 bills.

   (a) Write a system of three linear equations in three variables modeling the bag content.

   (b) Find out how many bills of each kind there were in the bag.

QUANTITIES: $O + T + H = 175$

Q.R → VALUE: $1 \cdot O + 10 \cdot T + 100H = 5350$

$O = 2H \rightarrow O - 2H = 0$

AUGMENTED MATRIX $\left[\begin{array}{ccc|c} 1 & 1 & 1 & 175 \\ 1 & 10 & 100 & 5350 \\ 1 & 0 & -2 & 0 \end{array}\right] \xrightarrow{\text{RREF}} \left[\begin{array}{ccc|c} 1 & 0 & 0 & 100 \\ 0 & 1 & 0 & 25 \\ 0 & 0 & 1 & 50 \end{array}\right]$

$O = 100$

$T = 25$

$H = 50$

9. Solve the following system of linear equations.

$$\begin{cases} x - 3y + 2z = 12 \\ 2x - 6y + z = 7 \end{cases}$$

AUGMENTED: $\left[\begin{array}{ccc|c} 1 & -3 & 2 & 12 \\ 2 & -6 & 1 & 7 \end{array}\right] \xrightarrow{\text{RREF}} \left[\begin{array}{ccc|c} 1 & -3 & 0 & 2/3 \\ 0 & 0 & 1 & 17/3 \end{array}\right]$

$\begin{cases} X - 3Y = 2/3 \\ z = 17/3 \end{cases} \rightarrow \begin{cases} X = 3Y + 2/3 \\ Y = Y \\ z = 17/3 \end{cases}$

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4. (15 points) A car rental agency rents compact, mid-size, and luxury cars. Its goal is to purchase 90 cars with a total of $2,270,000 and to earn a daily rental of $3150 from all cars. The compact cars cost $18,000 each and earn $25 per day in rental, the mid-size cars cost $25,000 each and earn $25 per day, and the luxury cars cost $40,000 each and earn $55 per day.

X = # COMPACT
Y = # MID
Z = # LUXURY

(a) Write the system of linear equations describing the goals of this agency.

TOTAL NUMBER OF CARS: $X+Y+Z=90$

TOTAL INVESTMENT: $18{,}000X + 25{,}000Y + 40{,}000Z = 2{,}270{,}000$

TOTAL REVENUE: $25X + 25Y + 55Z = 3150$

NOTICE A TYPO FOR THE MIDZIZE CAR RENTAL RATE, SUPPOSED TO BE 35 $/DAY

(b) Find the number of each type of car the agency should purchase to meet its goal.

$$A = \begin{bmatrix} 1 & 1 & 1 & 90 \\ 18000 & 25000 & 40000 & 2270000 \\ 25 & 25 & 55 & 3150 \end{bmatrix}$$

$$RREF(A) \approx \begin{bmatrix} 1 & 0 & 0 & 61 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 30 \end{bmatrix}$$

THEREFORE $Y = -1$, WHICH IS NOT POSSIBLE, AND THE AGENCY CAN NOT REACH ITS GOALS.

NOTICE THAT WITH RATE 35 FOR MIDSIZE (Y), ONE WOULD HAVE $X=40$, $Y=30$, $Z=20$.

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Math 102-040 - Fall 2009 - Test 2

Instructor: Dr. Francesco Strazzullo Name KEY

Instructions. Only calculators are allowed on this examination. Point values of each problem are indicated. **Always use the appropriate wording and units of measure in your answers (when applicable). SHOW YOUR WORK NEATLY, PLEASE (no work, no credit).**

1. Find the x-coordinate of the vertex of the parabola $y = -0.2x^2 - 32x + 2$.

$$\text{VERTEX} = (h,k) \Rightarrow h = \frac{-b}{2a} = \frac{-(-32)}{-.2\cdot 2} = -\frac{32}{.4} = -\frac{32}{4/10}$$
$$= -\frac{32}{4}\cdot 10 = -80$$

WE COULD USE A GRAPHING CALCULATOR.

2. The profit for a product can be described by the function $P(x) = 40x - 3000 - .01x^2$ (measured in dollars), where x is the number of units produced and sold. To maximize profit, how many units must be produced and sold? What is the maximum possible profit?

P(X) IS A DOWNWARD PARABOLA, BECAUSE THE NUMERICAL COEFFICIENT OF X^2 IS NEGATIVE, THEN THE MAXIMUM IS AT THE VERTEX.

GRAPHING CALCULATOR OR COMPLETING THE SQUARE OR ALGEBRA.

$$\text{VERTEX} = (h,k) \Rightarrow h = \frac{-b}{2a} = \frac{-40}{2\cdot(-.01)} = \frac{20}{1/100} = 2000$$

$$k = P(h) = P(2000) = 40\cdot 2000 - 3000 - .01\cdot 2000^2 = 37{,}000$$

THE MAXIMUM PROFIT POSSIBLE IS OF 37,000 DOLLARS AND IT IS ACHIEVED WHEN SELLING 2000 UNITS.

3. Solve the equation $2x^2 + 2x - 12 = 0$. (Show your work)

CALCULATOR (WITH GRAPH) OR ALGEBRA:

$\frac{2x^2+2x-12}{2} = \frac{0}{2} \rightarrow x^2 \underbrace{\boxed{+}}_{\text{SUM}} x \underbrace{\boxed{-6}}_{\text{PRODUCT}} = 0 \rightarrow$ PRODUCT $3 \cdot (-2)$

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

$x - 2 = 0 \rightarrow x = 2$

$x + 3 = 0 \rightarrow x = -3$

4. The profit for a product is given by $P(x) = -12x^2 + 1320x - 21{,}600$ (measured in dollars), where x is the number of units produced and sold. How many units give break even for this product?

BREAK EVEN IS $P(x) = 0$.

$\frac{-12x^2 + 1320x - 21{,}600 = 0}{-12} \rightarrow x^2 \underbrace{- 110}_{\text{SUM}} x \underbrace{\boxed{+1800}}_{\text{PRODUCT}} = 0$

PRODUCT $-90, -20$

$(x-90)(x-20) = 0$

$x - 90 = 0 \rightarrow x = 90$

$x - 20 = 0 \rightarrow x = 20$

WE GET BREAK EVEN WHEN PRODUCING AND SELLING 90 OR 20 UNITS.

Math 102 - Spring 2010 - Test 2

Instructor: Dr. Francesco Strazzullo Name KEY

Instructions. Only calculators are allowed on this examination. Each problem is 10 points worth. **Always use the appropriate wording and units of measure in your answers (when applicable). SHOW YOUR WORK NEATLY, PLEASE (no work, no credit).**

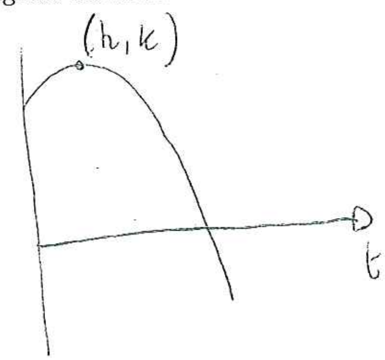
1. Find the x-coordinate of the vertex of the parabola $y = .35x^2 + 70x - 1$.

$$X = -\frac{b}{2a} = -\frac{70}{2 \cdot .35} = -100$$

2. The vertical displacement of a free falling rock can be described by the function $s(x) = -16t^2 + 20t + 198$ (measured in feet), where t is the time in seconds after the rock has been thrown. What is the maximum altitude that this rock will reach? How long does it take the rock to reach its highest altitude?

$$S(X) = -16t^2 + 20t + 198$$

DOWNWARD PARABOLA



MAXIMUM HIGHT AT VERTEX

$$h = -\frac{b}{2a} = \frac{-20}{-32} = .625$$

MAXIMUM HIGHT $= K = S(h) = S(.625) = 204.25$

THE ROCK REACHES THE MAXIMUM ALTITUDE OF 204.25 ft AFTER .625 SECONDS.

3. Solve the equation $-3x^2 - 9x + 84 = 0$. (Show your work)

$$\frac{-3x^2-9x+84}{-3} = \frac{0}{-3} \longrightarrow x^2 \boxed{+3}x \boxed{-28} = 0 \longrightarrow$$

SUM PRODUCT $7 \cdot (-4)$

$$\longrightarrow (x+7)(x-4)=0 \quad \begin{cases} x+7=0 \rightarrow x=-7 \\ x-4=0 \rightarrow x=4 \end{cases}$$

4. The profit for a product is given by $P(x) = -11x^2 - 1705x + 15950$ (measured in dollars), where x is the number of units produced and sold. How many units give break even for this product?

BREAK EVEN: $P(x) = 0$

$$\frac{-11x^2-1705x+15950}{-11} = \frac{0}{-11} \longrightarrow x^2+155x-1450=0$$

QUADRATIC FORMULA: $x = \dfrac{-155 \pm \sqrt{155^2-4\cdot1\cdot(-1450)}}{2} \longrightarrow$

$$\longrightarrow x = \frac{-155 \pm 172.7}{2} \quad \begin{cases} x=(-155-172.7)/2 = -163.85 \\ x=(-155+172.7)/2 = 8.85 \end{cases}$$

NOT POSSIBLE A NEGATIVE PRODUCTION

PRODUCING ABOUT 9 UNITS (8.85) ONE BREAKS EVEN.

5. For the nonextreme weather months, Palmetto Electric charges \$7.10 plus 6.747 cents per kilowatt-hour (kWh) for the first 1200 kWh and \$88.06 plus 5.788 cents per kilowatt-hours above 1200.

   (a) Write the function that gives the monthly charge in dollars as a function of the kilowatt-hours used.

Y = COST = "FIXED COST" + RATE · QUANTITY ; "RATE" = PRICE , X kWh CONSUMED

$$Y = \begin{cases} 7.10 + .06747X, & 0 \le X \le 1200 \\ 88.06 + .05788(X-1200), & X > 1200 \end{cases}$$

; IN DOLLARS

   (b) What is the monthly charge if 960 kWh are used?

$$Y(960) = 7.10 + .06747 \cdot 960 = 71.8712$$

ABOUT \$71.87

   (c) What is the monthly charge if 1580 kWh are used?

$$Y(1580) = 88.06 + .05788(1580 - 1200)$$
$$= 110.0544$$

ABOUT \$110.05

3. The profit for a product is given by $P(x) = 4x^2 - 1320x - 28,000$ (measured in dollars), where x is the number of units produced and sold. How many units give break even for this product?

BREAK EVEN IS $P(X) = 0$:

$$4X^2 - 1320X - 28,000 = 0 \to \frac{4\left(X^2 - 330X - 7000\right)}{4} = \frac{0}{4} \to$$

$$\to X^2 \underbrace{- 330X}_{\text{SUM}} \underbrace{- 7000}_{\text{PRODUCT}} = 0 \to (X-350)(X+20) = 0 \to$$

$-350, 20$

$X + 20 = 0 \to X = -20$ REJECTED (PRODUCTION ≥ 0)

$X - 350 = 0 \to X = 350$

PRODUCING 350 UNITS BREAKS EVEN THE PRODUCTION.

(A GRAPHING CALCULATOR COULD BE USED)

4. Find the x-coordinate of the vertex of the parabola $y = 3x^2 - 4x - 7$.

X-COORDINATE OF THE VERTEX: $h = -\frac{b}{2a} = -\frac{-4}{2 \cdot 3} = \frac{2}{3}$

FOR CALCULATOR, FIND MAXIMUM.

5. The 2004 U.S. federal income tax owed by a married couple filing jointly can be found from the following table, where the percentage is taken on the taxable income.

If Taxable income is between	Taxable due is
\$0 – \$15,650	\$0.00 + 10%
\$15,650 – \$63,700	\$1,565 + 15%
\$63,700 – \$128,500	\$8,772.50 + 25%
\$128,500 – \$195,850	\$24,872.5 + 28%

(a) Write the piecewise-defined function T with input x that models the federal tax dollars owed as a function of x, the taxable income dollars earned, with $0 < x \leq 128,500$.

$$T(x) = \begin{cases} .1X & , 0 < X \leq 15,650 \\ 1565 + .15X & , 15,650 < X \leq 63,700 \\ 8772.5 + .25X & , 63700 < X \leq 128,500 \end{cases}$$

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(b) Use the function to find $T(42,000)$.

$$T(42,000) = 1565 + .15 \cdot 42000 = 7865$$

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(c) Find the tax owed on a taxable income of \$68,000.

3

IT IS ASKED FOR $T(68,000) = 8772.5 + .25 \cdot 68000 = 25772.5$

THE TAX OWED ON A TAXABLE INCOME OF \$ 68,000 IS 25,772.5 DOLLARS

1

10. The Hangup phone company charges \$12.15 plus 1.5 cents per minute calls for the first 400 minutes and \$18.15 plus 10.5 cents per minutes above 400, every month.

(a) Write the function that gives the monthly charge in dollars as a function of the minutes used.

$$Y = \begin{cases} 12.15 + 0.015X, & 0 \leq X \leq 400 \\ 18.15 + 0.105(X - 400), & X > 400 \end{cases}$$

NOTE: CENTS CHANGE TO DOLLARS: $1.5¢ = \$\frac{1.5}{100} = .015$

(b) What is the monthly charge if 320 minutes are used?

$Y(320) = 12.15 + .015 \cdot 320 = 16.95$ DOLLARS

(c) What is the monthly charge if 640 minutes are used?

$Y(640) = 18.15 + .105 \cdot (640 - 400)$

$= 43.35$ DOLLARS