MAT 1140 EXAM 3A (10) NAME _____

Show all work as necessary on this test or on separate paper. Sketch graphs as necessary. When calculator is used to solve a problem, explain the functions used.

1. Find the quadratic function with vertex $(1,-4)$ that passes through $(2,-3)$.

2. Find the minimum value of $f(x) = 4x^2 + 4x + 5$ (sketch!)

3. Sketch the graph of $y = -x^3 + 3x - 2$. Find all relative max and mins. Find all zeros.

4. Sketch the graph of $y = x^3 - 24x^2 + 75x + 100$ Find all zeros. Give RANGE.

5. Find all real zeros of $g(x) = x^3 + 3x^2 - 34x - 42$. Give radical form.

6. Find a polynomial with integer coefficients that has zeros $2, -2, 1-2i, 1+2i$.

7. Find <u>all</u> real and <u>complex</u> zeros of $f(x) = x^5 + x^3 + 2x^2 - 12x + 8$

8a) $\frac{6+i}{i}$

b) $\frac{3+2i}{5+i}$

9. The perimeter of a rectangle is 200 ft. Let x = width, and write a quadratic function that expresses area of the rectangle in terms of x. Of all rectangles with perimeter 200 ft, find the dimensions of the one with maximum area.

10. The cost C of ordering a certain product in thousands of dollars is given by

$$C = 100\left(\frac{200}{x^2} + \frac{x}{x+30}\right)$$

for $x \geq 1$. Find minimum cost C. Sketch the graph and give RANGE values.

12

In 11 – 12, solve the systems. Explain your methods. Give sketches, range values, procedures, etc.

11. $x^2 + y^2 = 169$
$3x + 2y = 39$

12. $\frac{x+3}{4} + \frac{y-1}{3} = 1$
$2x - y = 12$

13. Graph the demand and supply equations and find the point of equilibrium.

(Demand) $P = 100 - 0.05x$
(Supply) $p = 25 + 0.1x$

Give RANGE values.

14. Your expenses in producing an item include an initial £16,000 investment plus a cost of £3.45 per item. If the items sell for £5.95 each, how many must be sold to break even?

15. One hundred gallons of a 60% solution are obtained by mixing some 75% solution with some 50% solution. How many gallons of each must be used?

1. $V(1,-4)$ $(2,-3)$

$y = c(x-h)^2 + k$

$y = c(x-1)^2 + (-4)$

$-3 = c(2-1)^2 - 4$

$1 = c$

$y = (x-1)^2 - 4$

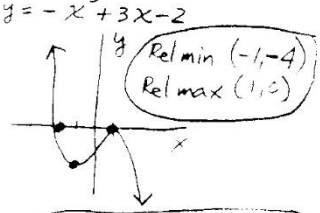
also $y = x^2 - 2x - 3$

2. $f(x) = 4x^2 + 4x + 5$

$f\,min = (-.5, 4)$

min = 4 at $x = -\frac{1}{2}$

3. $y = -x^3 + 3x - 2$



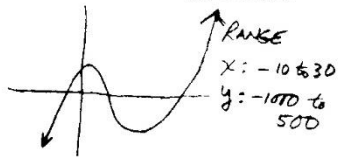
Rel min $(-1,-4)$

Rel max $(1,0)$

Zeros: $x = -2, 1, 1$

4. $y = x^3 - 24x^2 + 75x + 100$

Zeros: $x = -1, 5, 20$



RANGE

x: -10 to 30

y: -1000 to 500

5. $g(x) = x^3 + 3x^2 - 34x - 42$

Root $x = -7$ by "POLY" or "GRAPH".

-7 | 1 3 −34 −42

−7 28 42

1 −4 −6

$x^2 - 4x - 6 = 0$

$x^2 - 4x = 6$

$x^2 - 4x + 4 = 6 + 4$

$(x-2)^2 = 10$

$x = 2 \pm \sqrt{10}$

6. $x = 2, x = -2, x = 1 - 2i, x = 1 + 2i$

$(x-2)(x+2)(x-1+2i)(x-1-2i) = 0$

$(x^2-4)[(x-1)^2 - 4i^2] = 0$

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

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

$P(x) = x^4 - 2x^3 + 5x^2 - 4x^2 + 8x - 20$

$P(x) = x^4 - 2x^3 + x^2 + 8x - 20$

You may check with "POLY"

7. $f(x) = x^5 + x^3 + 2x^2 - 12x + 8$

Use "POLY"; ORDER = 5

$x = -2, \pm 2i, 1, 1$

8a) $(6,1) \div (0,1) = (1,-6) = 1 - 6i$

b) $\frac{(3+2i)(5-i)}{(5+i)(5-i)} = \frac{15 - 3i + 10i - 2i^2}{25 - i^2}$

$= \frac{15 + 7i + 2}{25 + 1} = \frac{17}{26} + \frac{7i}{26}$

9. $2W + 2L = 200$

$W + L = 100$

$L = 100 - W$

$A = WL$

$= x(100 - x)$

$A = 100x - x^2$

A_{MAX}: $x = 50$

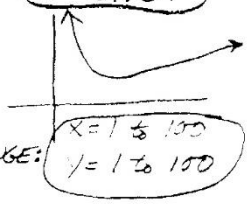
50 × 50; $A = 2500$

10. $C = 100\left(\frac{200}{x^2} + \frac{x}{x+30}\right)$

FMIN

$x = 40.44$

$C = 69.64$



RANGE: $x = 1$ to 100

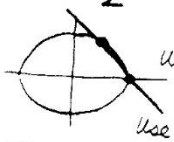
$y = 1$ to 100

11. $y = \sqrt{169 - x^2}$ $y = -\sqrt{169 - x^2}$

$y = \frac{(39 - 3x)}{2}$

$(5,12)$

$(13,0)$



Use ISECT for $(5,12)$

Use algebra to verify $(13,0)$.

RANGE:

$x: -15$ to 15

$y: -15$ to 15.

12. $\frac{x+3}{4} + \frac{y-1}{3} = 1$

$2x - y = 12$

$y = 2x - 12$

$\frac{x+3}{4} + \frac{2x-13}{3} - 1 = 0$

2 STD; Root $Y = 5$ $Y = -2$

13. $(100 - .05x) - (25 + 0.1x) = 0$

RANGE: $x = 1$ to 500 or more.

$x = 500$ $p = 75$

14. Let P = Profit for x units.

$P = 5.95x - 3.45x - 16000$

$2.50x = 16,000$

$x = 6400$ Items

15. $x + y = 100$

$.75x + .50y = 100(60)$

$.75x + .50(100 - x) - 60 = 0$

ROOTS $x = 40$ L .75%

$y = 60$ L 50%