Math 41
Quiz 5
Due March 14th in class

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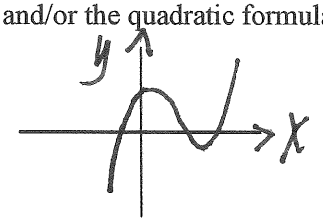
1. Find all real zeros of the function using the graph, synthetic division, factoring and/or the quadratic formula:

$f(x) = x^3 - 4x^2 + 3x + 2$



At most 3 real zeros

from graph 2 positive, 1 negative

possible rational zeros:

$\frac{\pm 1 \ \pm 2}{\pm 1} = \pm 1, \pm 2$

$$\begin{array}{r|rrrr} 2 & 1 & -4 & 3 & 2 \\ & & 2 & -4 & -2 \\ \hline & 1 & -2 & -1 & 0 \end{array}$$

$x = 2$ is a zero

rewrite

$x^2 - 2x - 1 = 0$

$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-1)}}{2(1)} = \frac{2 \pm \sqrt{8}}{2} = \frac{2 \pm 2\sqrt{2}}{2}$

$= \frac{2(1 \pm \sqrt{2})}{2}$

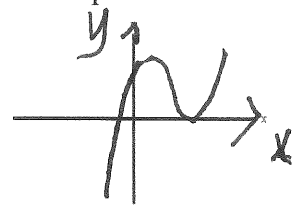
$= 1 \pm \sqrt{2}$

Real zeros: $x = 2, \ 1 \pm \sqrt{2}$

f.y.i. $x = 2, \ x \approx 2.4, -0.4$

2. Find all real zeros of the function using the graph, synthetic division, factoring and/or the quadratic formula:

$f(x) = 4x^3 - 15x^2 + 12x + 4$



At most 3 real zeros

1 negative, 2 positive

(multiplicity 2?)

possible rational zeros:

$$\frac{\pm 1 \pm 2 \pm 4}{\pm 1 \pm 2 \pm 4} = \pm\frac{1}{4}, \pm\frac{1}{2}, \pm 1, \pm 2, \pm 4$$

2	4	-15	12	4
		8	-14	-4
	4	-7	-2	0

$x = 2$ is a zero

rewrite

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

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

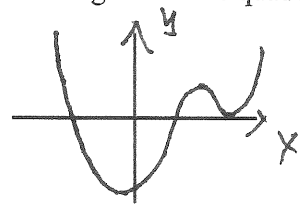
$4x + 1 = 0 \quad x - 2 = 0$

$x = -1/4 \quad x = 2$

Real zeros:

$x = -1/4, 2$ (2 is of even multiplicity graph touches x-axis)

3. Find all real zeros of the function using the given graph, synthetic division, factoring and/or the quadratic formula: $f(x) = x^4 - 6x^3 + 7x^2 + 12x - 18$



At most 4 real zeros

1 negative, 3 positive

(multiplicity?)

possible rational zeros:

$$\frac{\pm 1 \pm 2 \pm 3 \pm 6 \pm 9 \pm 18}{\pm 1} = \pm 1 \pm 2 \pm 3 \pm 6 \pm 9 \pm 18$$

3	1	-6	7	12	-18
		3	-9	-6	18
	1	-3	-2	6	0

$x = 3$ is a zero

3	1	-3	-2	6
		3	0	-6
	1	0	-2	0

$x = 3$ is a zero

rewrite: $x^2 - 2 = 0$

$x^2 = 2$

$x = \pm\sqrt{2}$

Real zeros:

$x = \pm\sqrt{2}, 3$

f.y.i. $x \approx \pm 1.4, 3$