Algebra 2 - Unit 3 Test 2 Review Name KEY Date ______ Block ______

Use the remainder theorem (direct substitution) and synthetic division to determine whether the given value is a zero of the polynomial. Be sure to include your conclusion statement.

1. $f(x) = -2x^3 + 4x^2 - 6x$

a.) $f(-1) = -2(-1)^3 + 4(-1)^2 - 6(-1)$
$= 12$

$$\begin{array}{r|rrrr} -1 & -2 & 4 & -6 & 0 \\ & \downarrow & 2 & -6 & 12 \\ \hline & -2 & 6 & -12 & \boxed{12} \end{array}$$

* No, $x=-1$ is NOT a zero.

b.) $f(0) = -2(0)^3 + 4(0)^2 - 6(0)$
$= 0$

$$\begin{array}{r|rrrr} 0 & -2 & 4 & -6 & 0 \\ & \downarrow & 0 & 0 & 0 \\ \hline & -2 & 4 & -6 & \boxed{0} \end{array}$$

* yes, $x=0$ is a zero.

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

a.) $f(0) = 2(0)^3 + 7(0)^2 + 2(0) - 3$
$= -3$

$$\begin{array}{r|rrrr} 0 & 2 & 7 & 2 & -3 \\ & \downarrow & 0 & 0 & 0 \\ \hline & 2 & 7 & 2 & \boxed{-3} \end{array}$$

* No, $x=0$ is NOT a zero.

b.) $f(\frac{1}{2}) = 2(\frac{1}{2})^3 + 7(\frac{1}{2})^2 + 2(\frac{1}{2}) - 3$
$= 0$

$$\begin{array}{r|rrrr} \frac{1}{2} & 2 & 7 & 2 & -3 \\ & \downarrow & 1 & 4 & 3 \\ \hline & 2 & 8 & 6 & \boxed{0} \end{array}$$

* yes, $x=\frac{1}{2}$ is a zero.

Given the following functions and x-intercepts find the remaining zero.

3. $f(x) = x^3 - 3x^2 - 10x + 24$; -3, 4, 2

$$\begin{array}{r|rrrr} -3 & 1 & -3 & -10 & 24 \\ & \downarrow & -3 & 18 & -24 \\ \hline 4 & 1 & -6 & 8 & \boxed{0} \\ & \downarrow & 4 & -8 & \\ \hline & 1 & -2 & \boxed{0} & \end{array}$$

x c

$x - 2 = 0$
$x = 2$

4. $f(x) = 6x^3 - x^2 - 5x + 2$; -1, $\frac{1}{2}$, $\frac{2}{3}$

$$\begin{array}{r|rrrr} -1 & 6 & -1 & -5 & 2 \\ & \downarrow & -6 & 7 & -2 \\ \hline \frac{1}{2} & 6 & -7 & 2 & \boxed{0} \\ & \downarrow & 3 & -2 & \\ \hline & 6 & -4 & \boxed{0} & \end{array}$$

x c

$6x - 4 = 0$
$6x = 4$
$x = \frac{4}{6} = \frac{2}{3}$

List all possible rational roots. Then use a calculator, synthetic division and factoring to find all zeros & write in factored form (no fractions).

C: 1, 32, 2, 16, 4, 8
L: 1, 3

5. $3x^4 + 19x^3 + 26x^2 - 16x - 32$

Possible Zeros (PRR): $\pm 1, \pm\frac{1}{3}, \pm 32, \pm\frac{32}{3}, \pm 2, \pm\frac{2}{3}, \pm 16, \pm\frac{16}{3}, \pm 4, \pm\frac{4}{3}, \pm 8, \pm\frac{8}{3}$

SHOW WORK HERE:

$$\begin{array}{r|rrrrr} 1 & 3 & 19 & 26 & -16 & -32 \\ & \downarrow & 3 & 22 & 48 & 32 \\ \hline -2 & 3 & 22 & 48 & 32 & \boxed{0} \\ & \downarrow & -6 & -32 & -32 & \\ \hline -4 & 3 & 16 & 16 & \boxed{0} & \\ & \downarrow & -12 & -16 & & \\ \hline & 3 & 4 & \boxed{0} & & \end{array}$$

x c

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

Zeros: $x=1$, $x=-2$, $x=-4$, $x=\frac{-4}{3}$

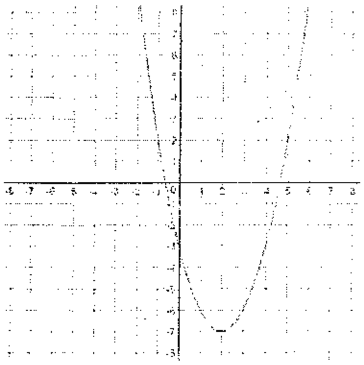
Factored Form: f(x) = $(x-1)(x+2)(x+4)(3x+4)$

Given the following functions:

a.)State the number and type of zeros (# of real and/or # of imaginary). Find the discriminant when necessary.

b.) Use synthetic division to prove x-intercepts and find the remaining zeros (use quadratic formula when necessary).

6. $f(x) = x^2 - 4x - 3$



$a = 1$
$b = -4$
$c = -3$

Disc. $= b^2 - 4ac$
$= (-4)^2 - 4(1)(-3)$
$= 28$

a.) # of Zeros: 2

Types of Zeros: 2 Real

Discriminant: 28

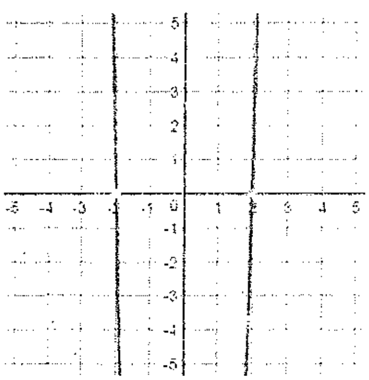
b.) Zeros: x = $\sqrt{7}+2, -\sqrt{7}+2$

(include ALL zeros)

$x = \dfrac{-(-4) \pm \sqrt{28}}{2(1)}$

$x = \dfrac{4 \pm \sqrt{28}}{2} = \begin{cases} \sqrt{7}+2 \\ -\sqrt{7}+2 \end{cases}$

7. $f(x) = x^4 + 3x^2 - 28$



a.) # of Zeros: 4

Types of Zeros: 2 Real, 2 Imag.

Discriminant: n/a ~~or~~ -28

b.) Zeros: x = $-2, 2, i\sqrt{7}, -i\sqrt{7}$

(include ALL zeros)

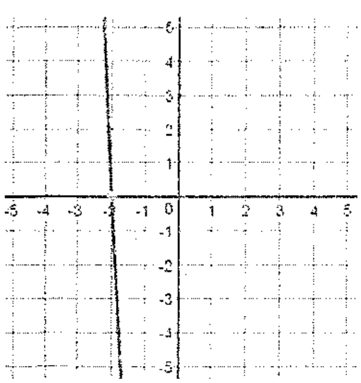
$$\begin{array}{r|rrrrr} -2 & 1 & 0 & 3 & 0 & -28 \\ & \downarrow & -2 & 4 & -14 & 28 \\ \hline 2 & 1 & -2 & 7 & -14 & \boxed{0} \\ & \downarrow & 2 & 0 & 14 & \\ \hline & 1 & 0 & 7 & \boxed{0} & \\ & x^2 & x & c & & \end{array}$$

$x = \dfrac{-(0) \pm \sqrt{(0)^2 - 4(1)(7)}}{2(1)}$

$x = \dfrac{0 \pm \sqrt{-28}}{2} = \dfrac{\pm i\sqrt{28}}{2}$

$x^2 + 7 = 0$
$x^2 = -7$
$x = \pm\sqrt{-7}$
$x = \pm i\sqrt{7}$

8. $f(x) = -x^3 + 2x^2 - 16$



a.) # of Zeros: 3

Types of Zeros: 1 Real, 2 Imag.

Discriminant: -16

b.) Zeros: x = $-2, 2-2i, 2+2i$

(include ALL zeros)

$$\begin{array}{r|rrrr} -2 & -1 & 2 & 0 & -16 \\ & \downarrow & 2 & -8 & 16 \\ \hline & -1 & 4 & -8 & \boxed{0} \\ & a & b & c & \end{array}$$

Disc $= (4)^2 - 4(-1)(-8)$
$= -16$

$x = \dfrac{-(4) \pm \sqrt{-16}}{2(-1)}$

$x = \dfrac{-4 \pm 4i}{-2} = \begin{cases} 2-2i \\ 2+2i \end{cases}$