Name:_____ Date:_____

Pre-Calculus Review #4

1. Rationalize the denominator, express in simplest form:

   a. $\dfrac{10-\sqrt{6}}{4\sqrt{2}}$ b. $\dfrac{2}{5+\sqrt{5}}$

2. Find the inverse of the function:

   a. $f(x)=3x+8$ b. $h(x)=-\sqrt{x}+8,\quad x\geq 0$

3. Find the polynomial function whose zeros are given:

   a. $0,\ \sqrt{5}$ b. $5,\ 2+\sqrt{2}$

4. Find all possible rational zeros:

   a. $f(x)=2x^3-5x^2+7x-17$ b. $g(x)=3x^3+32x^2+32x+27$

5. List the factors of the polynomial, find all the zeros of the given function using the Rational Zero Test and division.

   a. $f(x)=x^3-2x^2-23x+60$ b. $g(x)=10x^3-59x^2-8x+12$

6. Perform the indicated operation, express in simplest form:

   a. $(3-5i)+(6-8i)$ b. $(1+9i)-(8+3i)$

   c. $(4+6i)(2-i)$ d. $(3-5i)^2$

   e. $\left(3+\sqrt{-4}\right)+\left(2-\sqrt{-36}\right)$ f. $\left(9-\sqrt{-24}\right)-\left(3-\sqrt{-54}\right)$

7. Find $\dfrac{f(x+h)-f(x)}{h}$, where $h\neq 0$

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

8. Rationalize the denominator, express in simplest form:

   a. $\dfrac{4-10i}{2i}$ b. $\dfrac{5}{3-4i}$

9. For the given function find the relative minimums and maximums and the intervals where the function is increasing and decreasing (round any decimal to the nearest hundredth).

   a. $f(x)=x^2-4x-12$ b. $f(x)=2x^3-3x+8$

Name: Answer Key Pd: _____ Date: _____

Ms. Schmidt Pre-Calculus

Review for Test #4

1a)

$$\frac{10-\sqrt{6}(\sqrt{2})}{4\sqrt{2}(\sqrt{2})} \quad \frac{10\sqrt{2}-\sqrt{12}}{4\cdot 2} \quad \sqrt{12}=\sqrt{4}\sqrt{3}$$

$$\frac{10\sqrt{2}-2\sqrt{3}}{8} = \frac{5}{4}\sqrt{2}-\frac{\sqrt{3}}{4}$$

1b)

$$\frac{2}{5+\sqrt{5}}\cdot\frac{(5-\sqrt{5})}{(5-\sqrt{5})} = \frac{10-2\sqrt{5}}{25-5} =$$

$$\frac{10-2\sqrt{5}}{20} = \frac{1}{2}-\frac{\sqrt{5}}{10}$$

2a) $f(x)=3x+8$

$x = 3y+8$

$-8 \quad -8$

$\frac{x-8}{3} = \frac{3y}{3}$

$\frac{x-8}{3} = f^{-1}(x)$

2b) $h(x) = -\sqrt{x}+8$

$x = -\sqrt{y}+8$

$-8 \quad -8$

$\frac{x-8}{-1} = \frac{-\sqrt{y}}{-1}$

$(-x+8)^2 = (\sqrt{y})^2$

$(-x+8)^2 = f^{-1}(x)$

3a)

$x=0 \quad (x)^2=(\sqrt{5})^2$

$x=0 \quad x^2=5$

$x^2-5=0$

$x(x^2-5)$

$f(x) = x^3-5x$

3b)

$x=5 \quad x=2+\sqrt{2}$

$-5 \quad -5 \quad -2 \quad -2$

$x-5=0 \quad (x-2)^2=(\sqrt{2})^2$

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

$-2 \quad -2$

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

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

$x^3-4x^2+2x-5x^2+20x-10$

$f(x) = x^3-9x^2+22x-10$

4a) $f(x) = 2x^3-5x^2+7x-17$

$\frac{\pm 17, \pm 1}{\pm 2, \pm 1} = \frac{17}{2}, \frac{-17}{2}, \frac{17}{1}, \frac{-17}{1}$

$\frac{1}{2}, \frac{-1}{2}, \frac{1}{1}, \frac{-1}{1}$

Possible zeros ↗

4b) $g(x) = 3x^3+32x^2+32x+27$

$\frac{\pm 27, \pm 1, \pm 3, \pm 9}{\pm 1, \pm 3} = \frac{27}{1}, \frac{-27}{1}, \frac{27}{3}=9,$

$\frac{-27}{3}=-9, \frac{1}{1}, \frac{-1}{1},$

$\frac{3}{1}, \frac{-3}{1}, \frac{1}{3}, \frac{-1}{3}$

Possible zeros ↗

5a) $f(x) = x^3 - 2x^2 - 23x + 60$

$\pm 60, \pm 1, \pm 2, \pm 30, \pm 3, \pm 20, \pm 4, \pm 15, \pm 5, \pm 12, \pm 6, \pm 10$

± 1

$f(3) = 0$ ✓

3	1	-2	-23	60
	↓	3	3	-60
	1	1	-20	0

$x^2 + x - 20$

$(x+5)(x-4)$ $(x-3)$ ← factors

$x+5=0$ $x-4=0$ $x-3=0$

$x=-5$ $x=4$ $x=3$ ← zeros

5b) $g(x) = 10x^3 - 59x^2 - 8x + 12$

$\pm 12, \pm 1, \pm 6, \pm 2, \pm 3, \pm 4$

$\pm 10, \pm 1, \pm 2, \pm 5$

$g(6) = 0$

6	10	-59	-8	12
	↓	60	6	-12
	10	1	-2	0

$10x^2 + x - 2$ $(-20x^2)$

$10x^2 + 5x - 4x - 2$

$5x(2x+1) - 2(2x+1)$ ← factors

$(5x-2)(2x+1)(x-6)$

$5x-2=0$ $2x+1=0$ $x-6=0$

$x = 2/5$ $x = -1/2$ $x=6$ ← zeros

6a) $(3-5i) + (6-8i)$

$9 - 13i$

6b) $(1+9i) - (8+3i)$

$1 + 9i - 8 - 3i$

$-7 + 6i$

6c) $(4+6i)(2-i)$

$8 - 4i + 12i - 6i^2$

$8 - 4i + 12i + 6$

$14 + 8i$

6d) $(3-5i)^2$

$(3-5i)(3-5i)$

$9 - 15i - 15i + 25i^2$

$9 - 15i - 15i - 25$

$-16 - 30i$

6e) $(3+\sqrt{-4}) + (2 - \sqrt{-36})$

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

$5 - 2i$

6f) $(9 - \sqrt{-24})(3 - \sqrt{-54})$

$i\ \sqrt{4}\ \sqrt{6}$ $i\ \sqrt{9}\ \sqrt{6}$

$(9 - 2i\sqrt{6}) - (3 - 3i\sqrt{6})$

$9 - 2i\sqrt{6} - 3 + 3i\sqrt{6}$

$6 + i\sqrt{6}$

7a) $f(x) = 4x+7$

$$\frac{f(x+h)-f(x)}{h}$$

$$\frac{[4(x+h)+7]-[4x+7]}{h}$$

$$\frac{4x+4h+7-4x-7}{h}$$

$$\frac{4h}{h} = 4$$

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

$$\frac{f(x+h)-f(x)}{h}$$

$$\frac{[(x+h)^2+3(x+h)-2]-[x^2+3x-2]}{h}$$

$$\frac{x^2+2xh+h^2+3x+3h-2-x^2-3x+2}{h}$$

$$\frac{2xh+h^2+3h}{h}$$

$$\frac{h(2x+h+3)}{h}$$

$$2x+h+3$$

8a) $\frac{4-10i\,(i)}{2i\,(i)} = \frac{4i-10i^2}{2i^2} =$

$$\frac{4i-10(-1)}{2(-1)} = \frac{4i+10}{-2} = -2i-5$$

$-5-2i$

8b) $\frac{5\,(3+4i)}{3-4i\,(3+4i)} = \frac{15+20i}{9-16i} =$

$$\frac{15+20i}{9+16i} = \frac{15+20i}{25}$$

$$\frac{3}{5}+\frac{4i}{5}$$

9a) $f(x) = x^2-4x-12$

max → none

min → (2, −16)

Increasing $(2,\infty)$

Decreasing $(-\infty,2)$

9b) $f(x) = 2x^3-3x+8$

max → (−.707, 9.414)

min → (.707, 6.586)

Increasing $(-\infty,-.707)\,(.707,\infty)$

Decreasing $(-.707,.707)$