Serial #: ________ ID ______________ NAME ____

Show all necessary steps for full marks.

Question 1: (4 points) (1.6 Example 9): Solve $12x^4 - 11x^2 + 2 = 0$

Solution

$12(x^2)^2 - 11x^2 + 2 = 0$	$x^4 = (x^2)^2$
$12u^2 - 11u + 2 = 0$	Let $u = x^2$; thus $u^2 = x^4$.
$(3u - 2)(4u - 1) = 0$	Solve the quadratic equation.
$3u - 2 = 0$ or $4u - 1 = 0$	Zero-factor property
$u = \frac{2}{3}$ or $u = \frac{1}{4}$	
$x^2 = \frac{2}{3}$ or $x^2 = \frac{1}{4}$	Replace u with x^2.
$x = \pm\sqrt{\frac{2}{3}}$ or $x = \pm\sqrt{\frac{1}{4}}$	Square root property (Section 1.4)
$x = \frac{\pm\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$ or $x = \pm\frac{1}{2}$	Simplify radicals. (Section R.7)
$x = \pm\frac{\sqrt{6}}{3}$	

Check that the solution set is $\left\{\pm\frac{\sqrt{6}}{3}, \pm\frac{1}{2}\right\}$.

Question 2: (4 points) (1.6 Exercise 52): Solve $\sqrt{2x-5} - \sqrt{x-2} = 2$

Solution (a):

52.

$$\sqrt{2x-5} = 2 + \sqrt{x-2}$$
$$\left(\sqrt{2x-5}\right)^2 = \left(2 + \sqrt{x-2}\right)^2$$
$$2x - 5 = 4 + 4\sqrt{x-2} + (x-2)$$
$$2x - 5 = x + 2 + 4\sqrt{x-2}$$
$$x - 7 = 4\sqrt{x-2}$$
$$(x-7)^2 = \left(4\sqrt{x-2}\right)^2$$
$$x^2 - 14x + 49 = 16(x-2)$$
$$x^2 - 14x + 49 = 16x - 32$$
$$x^2 - 30x + 81 = 0 \Rightarrow (x-3)(x-27) = 0$$
$$x = 3 \text{ or } x = 27$$

Check $x = 3$.

$$\sqrt{2x-5} = 2 + \sqrt{x-2}$$
$$\sqrt{2(3)-5} \stackrel{?}{=} 2 + \sqrt{3-2}$$
$$\sqrt{6-5} = 2 + \sqrt{1}$$
$$\sqrt{1} = 2 + 1 \Rightarrow 1 = 3$$

This is a false statement. 3 is not a solution.

Check $x = 27$.

$$\sqrt{2x-5} = 2 + \sqrt{27-2}$$
$$\sqrt{2(27)-5} \stackrel{?}{=} 2 + \sqrt{27-2}$$
$$\sqrt{54-5} = 2 + \sqrt{25}$$
$$\sqrt{49} = 2 + 5 \Rightarrow 7 = 7$$

This is a true statement. 27 is a solution.

Solution set: {27}

Question 3: (4 points): (1.7 Exercise 86): Solve $\frac{x+2}{3+2x} \le 5$

Solution:

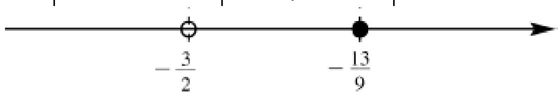
$$\frac{x+2}{3+2x} - 5 \le 0$$

$$\frac{x+2-15-10x}{3+2x} \le 0$$

$$\frac{-9x-13}{3+2x} \le 0$$

Critical values: $-\frac{3}{2}$ $\quad -\frac{13}{9}$

$-19x-13$	$+$	$+$	$-$
$3+2x$	$-$	$+$	$+$
$\frac{-19x-13}{3+2x}$	$-$	$+$	$-$



Solution set: $\left(-\infty, -\frac{3}{2}\right) \cup \left[-\frac{13}{9}, \infty\right)$

Question 4: (4 points) (1.8 Example 3 and 4): Solve

(a): $|2-7x|-1>4$

(b): $|2-5x| \ge -4$

(c): $|4x-7| < -3$

Solution (a):

	$\lvert 2-7x \rvert > 5$		Add 1 to each side.
$2-7x < -5$	or	$2-7x > 5$	Property 4
$-7x < -7$	or	$-7x > 3$	Subtract 2.
$x > 1$	or	$x < -\frac{3}{7}$	Divide by -7; reverse the direction of each inequality. (Section 1.7)

The solution set is $\left(-\infty, -\frac{3}{7}\right) \cup (1, \infty)$.

(b): $|2-5x| \ge -4$

Since the absolute value of a number is always nonnegative, the inequality $|2-5x| \ge -4$ is always true. The solution set includes all real numbers, written $(-\infty, \infty)$.

(c): $|4x-7| < -3$

There is no number whose absolute value is less than -3 (or less than *any* negative number). The solution set of $|4x-7| < -3$ is $\emptyset$.

Question 5: (4 points) (Page 166, Review Exercise 125-127):

(a): Solve $|x^2+4x| \le 0$

(b): Solve $|x^2+4x| > 0$

(c): Write as an absolute value equation: k is 12 units from 6 on the number line.

(d): Write as an absolute value inequality: p is at least 3 units from 1 on number line.

Solution (a):

(a):

$|x^2+4x| \le 0$ is only true when $|x^2+4x| = 0.$

$|x^2+4x| = 0 \Rightarrow x^2+4x=0 \Rightarrow x(x+4)=0$

$x=0$ or $x+4=0$

$x-0$ or $x=-4$

Solution set: $\{-4, 0\}$

(b):

$|x^2+4x| > 0$ will be false only when $x^2+4x=0,$ which occurs when $x=-4$ or $x=0$ (see last exercise). So the solution set for $|x^2+4x|>0$ is

$(-\infty,-4)\cup(-4,0)\cup(0,\infty).$

(c):

"k is 12 units from 6 on the number line" means that the distance between k and 6 is 12 units, or $|k-6|=12$ or $|6-k|=12$.

(d):

"p is at least 3 units from 1 on the number line" means that p is 3 units or more from 1. Thus, the distance between p and 1 is greater than or equal to 3, or $|p-1|\ge 3$ or $|1-p|\ge 3$.