Please print this out and write your solutions on this document. 30pts to earn here. Thanks!

Problem 1: (2pt) Let $A = \{x \in \mathbb{R} \mid |x - 2| \leq 1\}$ and $B = \{x \in \mathbb{R} \mid x \geq 3\}$.

     (a.) picture A and B on a number line,

     (b.) express A and B in interval notation,

     (c.) express $A \cup B$ in interval notation,

     (d.) find and express $A \cap B$ in set-builder notation.

Problem 2: (3pt) Assume $x, y > 0$ and use laws of algebra to determine A, B as indicated below:

     (a.) $\dfrac{6x^A}{y^B} = \dfrac{6xy^{-2}}{(x^2y)^3\sqrt{x}}$

     (b.) $x^A y^B = \sqrt{\dfrac{x\sqrt{y}}{x^{-2}y^3}}$

     (c.) $x^A y^B = \left(\sqrt[5]{x^3y^2} \sqrt[3]{x^6y^9} \right)^2$

Problem 3: (2pt) Find the domain of each expression. Please write your answer in interval notation.

(a.) $4x^2 - 9x + 3$

(b.) $\sqrt{2x + 7}$

(c.) $\dfrac{5x}{x^2 + 4x + 5}$

(d.) $\dfrac{6x + 3}{x^2 + 5x + 4}$

Problem 4: (2pt) Peform the addition and simplify the resulting expression.

(a.) $\dfrac{3x - 2}{x + 1} + 2$

(b.) $1 + \dfrac{1}{1 + \frac{1}{1+x}}$

Problem 5: (2pt) The **standard form** of a polynomial is an expression of the form

$$a_n x^n + a_{n-1} x^{n-1} + \cdots a_2 x^2 + a_1 x + a_0$$

where $a_n \neq 0$ and $a_n, \cdots, a_1, a_0$ are constants. Multiply the following polynomials and collect like power terms to give your answer in standard form:

(a.) $(x+1)(2x^2 - x + 1)$

(b.) $x^5 + (2x+1)^3$

Problem 6: (6pt) Factor the following polynomials completely over $\mathbb{R}^1$,

(a.) $30x^3 + 15x^4$,

(b.) $x^2 - 14x + 48$,

(c.) $2x^2 + 7x - 4$,

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[1]to factor a polynomial over a set of numbers indicates the kind of coefficients you may use. For example, $x^2 + 1$ is completely factored over $\mathbb{R}$, but $x^2 + 1 = (x+i)(x-i)$ over $\mathbb{C}$.

(d.) $8x^2 + 10x + 3$,

(e.) $(x^2 + 10x + 25)^2$,

(f.) $x^4 - 13x^2 + 36$.

Problem 7: (3pt) Solve the following polynomial equations. You can just write down the answers here since they should be immediately clear from your work on the previous problem.

(a.) $30x^3 + 15x^4 = 0$,

(b.) $x^2 - 14x + 48 = 0$,

(c.) $2x^2 + 7x - 4 = 0$,

(d.) $8x^2 + 10x + 3 = 0$,

(e.) $(x^2 + 10x + 25)^2 = 0$,

(f.) $x^4 - 13x^2 + 36 = 0$.

Problem 8: (5pt) For each quadratic polynomial $f(x)$ given below, complete the square and find all real or complex solutions of $f(x) = 0$:

(a.) $f(x) = x^2 + 6x + 13$,

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

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

(d.) $f(x) = 4x^2 - 16x + 15$,

(e.) $f(x) = 2x^2 + 8x + 10$.

Problem 9: (4pt) Solve the following over $\mathbb{R}$,

(a.) $\dfrac{2x-1}{x+2} = \dfrac{4}{5}$,

(b.) $\sqrt{5-x} + 1 = x - 2$,

(c.) $|3x+5| = 11$.

(d.) $\sqrt{1+x} + \sqrt{1-x} = 2,$

Problem 10: (1pt) Find real numbers a, b for which $a + ib = \dfrac{(7-i)(4+2i)}{(3-7i)^2}.$