

### Assignment 4 (Part I)

1. Let  $a$ ,  $b$ , and  $c$  be real numbers. Show that if  $a \geq b$  and  $c < 0$ , then  $a^2 + b^2 + 5a - 5b - 4c > 0$ .
2. Let  $x, y$  be real numbers. Suppose that  $x < 0$  and  $y > 3$ . Determine whether each of the following inequalities is true or not. Explain your answer.

(a)  $3x - xy > 0$ .

(b)  $\frac{3}{x} - \frac{y}{x} + x^2 + y^3 > 18$

3. Find the solution set for each of following inequalities.

(a)

$$\frac{2x}{1-x} \geq \frac{1-x}{2x}$$

(b)

$$\frac{16x^4 - 81}{6x^2 + x - 12} < 0$$

(c)

$$\frac{x^4 - 2x^2 - 8}{2x + 1} \geq 0$$

(d)

$$\frac{x^4 + x^3 + 2x^2 + 2x}{x - 1} \leq 0$$

(e)

$$\left( \frac{x}{x-3} - 2 \right) \left( \frac{e^x}{\cos(x) + 2} \right) \geq 0$$

4. (Optional) Find the solution set for each of the following inequities.

(a)  $\frac{x-1}{x+1} \leq 0$

(b)  $\frac{-x^2-x}{2-x} \geq 0$

(c)  $\frac{2x}{x-2} - \frac{3x}{x-4} \leq 1$

(d)  $\frac{(2x^2+4x+7)(x-1)}{x^3-5x^2+x-5} \leq 0$

(e)  $\frac{x^2+8}{x^2+x+6} \geq 0$

(f)  $\frac{x^2-2x-4}{x^2-x-6} \geq 0$

(g)  $\frac{2x-x^2-3}{x-2x^2-1} \leq 1$

(h)  $\frac{(-x^2+5x-7)(2x+1)}{x^4-1} \geq 0$

(i)  $\frac{x^2-1}{2-3x+x^2} > \frac{1}{x}$

(j)  $\frac{x^4+6x^2}{1-2x} \leq x^2$

(k)  $x^5 + 3x^4 - 23x^3 - 51x^2 + 94x + 120 \geq 0$