

**Math 114**  
**Exam II Review**  
**(Show all your work!)**

1. Divide and write your answer in standard form:  $\frac{3 - \sqrt{-16}}{2 + \sqrt{-25}}$

2. Graph the following quadratic function. Find the vertex,  $x$ -intercept, and  $y$ -intercept.

$$f(x) = x^2 - 4x - 5$$

3. Solve the following equation by using the quadratic formula.

$$4 - \frac{1}{x} = \frac{2}{x^2}$$

4. Find the number  $k$  such that the given equation has exactly one real solution.

$$kx^2 + 6x + 1 = 0$$

5. Solve the inequality and write answer in interval notations and graph the solution on the number line.

$$x^2 \geq -5x + 14$$

6. Find the dimensions of the rectangular area that can be enclosed with 80 feet of fencing such that the area is as large as possible. Find the largest area.

7. Sketch a complete graph of the following function. Label each  $x$ -intercept,  $y$ -intercept, and the coordinates of each local extremum.

$$f(x) = x^4 + 10x^3 + 21x^2 - 40x - 80$$

8. Use the intermediate value theorem to show that the graph of the following function has an  $x$ -intercept in the given interval. Find the  $x$ -intercept.

$$f(x) = 2x^3 + 6x^2 - 8x + 2; \quad [-5, -4]$$

9. Factor  $P(x)$  into linear factors given that  $P(2) = 0$ .

$$P(x) = 2x^3 - 3x^2 - 17x + 30$$

10. For the given polynomial, find the remaining zeros if  $3i$  is a zero.

$$P(x) = x^4 - x^3 + 10x^2 - 9x + 9$$

**11.** Find the maximum number of roots, all possible roots, use Descartes' rule of signs to find the number of positive roots, number of negative roots, and find all rational roots of the polynomial  $P(x)$ .

$$P(x) = x^3 - 2x^2 - 13x - 10$$

**12.** Find the maximum number of roots, all possible roots, use Descartes' rule of signs to find the number of positive roots, number of negative roots, and find all rational roots of the polynomial  $P(x)$ .

$$P(x) = 2x^4 + 3x^3 - 4x^2 - 3x + 2$$

**13.** Find a function  $P(x)$  defined by a polynomial of lowest degree with real coefficients having the given zeros.

$$2 + i, \text{ and } -2 \text{ (multiplicity 2)}$$

**14.** Solve the inequality and give the solution in interval notation.

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

**15.** Analyze the rational function algebraically; list its vertical asymptote(s), horizontal asymptote,  $x$ -intercept and  $y$ -intercept (if any). Then sketch a complete graph of the rational function.

$$f(x) = \frac{x+6}{x-3}$$

**16.** Analyze the rational function algebraically; list its vertical asymptote(s), horizontal asymptote,  $x$ -intercept and  $y$ -intercept (if any). Then sketch a complete graph of the rational function.

$$f(x) = \frac{x}{2x^2 - 5x - 3}$$

**17.** Analyze the rational function algebraically; list its vertical asymptote(s), horizontal asymptote,  $x$ -intercept and  $y$ -intercept (if any). Then sketch a complete graph of the rational function.

$$f(x) = \frac{20}{x^2 - 3x - 10}$$

**18.** Solve the following equation algebraically and its related inequalities graphically.

(a)  $\frac{2x-4}{x-1} = 1$

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

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

**19.** Solve the following equation algebraically and its related inequalities graphically.

(a)  $\sqrt{2x+5} - \sqrt{3x-2} = 1$       (b)  $\sqrt{2x+5} - \sqrt{3x-2} \leq 1$       (c)  $\sqrt{2x+5} - \sqrt{3x-2} \geq 1$

**20.** Solve the following equation algebraically and its related inequalities graphically.

(a)  $(x^2 + 6x)^{1/4} = 2$       (b)  $(x^2 + 6x)^{1/4} > 2$       (c)  $(x^2 + 6x)^{1/4} < 2$