

**Test #3**

**Problem 1:** Graph the following parabola by determining whether the graph opens up or down and by finding its vertex, axis of symmetry,  $x$  and  $y$  intercepts, if any. Determine the domain and range of the function. Determine where the function is increasing and where it is decreasing:

$$p(x) = -2x^2 + 8x - 6.$$

**Problem 2:** The price  $p$  and the quantity  $x$  sold of a certain product obey the demand equation

$$p = -\frac{1}{2}x + 50, \quad 0 \leq x \leq 100.$$

- Express the revenue  $R$  as a function of  $x$ .
- What is the revenue if 10 units are sold?
- What quantity  $x$  maximizes the revenue? What is the maximum revenue?
- What price should the company charge to maximize the revenue?

**Problem 3:** Use transformations of the graph  $y = x^5$  to graph

$$q(x) = -(x - 1)^5 + 1.$$

**Problem 4:** For the polynomial function

$$f(x) = (x - 1)(x + 1)(x + 2)^2,$$

find the following

- $x$  and  $y$  intercepts,
- Determine whether the graph crosses or touches the  $x$ -axis at each  $x$ -intercept,
- Find the power of function that the graph of  $f$  resembles for large values of  $x$  and  $-x$ ,
- Find where  $f(x) > 0$  and where  $f(x) < 0$ .
- Plot the graph of  $f(x)$ .

**Problem 5:** Graph the following rational function, determine the asymptotes, intercepts and intervals where  $r(x) > 0$ :

$$r(x) = -\frac{1}{x^2 + 4x + 4}.$$

**Problem 6:** Solve the following inequality:

$$(x + 3)(x - 2)(x - 3) > 0.$$

**Problem 7:** Confirm that  $x - 1$  is factor of  $h(x) = 2x^4 - 2x^3 + 3x^2 - 2x - 1$ . Using the rule of signs, determine the number of real zeros. Find all possible rational zeroes of this polynomial.

**Problem 8:** Solve the equation in real number system:

$$x^4 + 2x^2 - 8 = 0.$$

**Problem 9:** Let  $f(x) = x^2 + \frac{1}{2}$ ,  $g(x) = 2x + 1$  and  $h(x) = -x$ . Find  $g \circ h$  and  $h \circ f$ .

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