

Spring, 1999  
Peterson

MATH 124.

HOMEWORK 5.

**DUE: Friday, February 26.**

P1. Find an equation of the straight line L in each case:

- (1) The point  $(6,4)$  is on L, and L is parallel to the line  $L': 2x + 3y = 7$ .
- (2) The point  $(6,4)$  is on L, and L is perpendicular to the line  $L': 2x + 3y = 7$ .
- (3) L is the perpendicular bisector of the line segment connecting the points  $(3,13)$  and  $(17,-15)$ .
- (4) L is the tangent line to the circle  $C: x^2 + y^2 - 10x + 4y + 9 = 0$  at the point  $(3,2)$ .

P2. Find the vertex of the parabola  $y = f(x)$  and also determine the range of  $f$  in each case:

Determine these things algebraically. Exact values are necessary.

- (1)  $f(x) = \frac{2}{3}x^2 - 5x + 7$ .
- (2)  $f(x) = -5x^2 - 3x + 1$ .
- (3)  $f(x) = (2x + 1)^2 + (x - 2)^2 - 10x + 6$ .

P3. When a company sells  $x$  items of one of its products, the revenue generated (i.e. the money taken in) is  $R(x)$  dollars, where  $R(x) = -2x^2 + 480x$ . In order to produce and sell this product, the company has fixed costs of \$3000 and a variable cost of \$40 for each item produced.

- (1) Let  $C(x)$  be the cost (in dollars) to produce and sell  $x$  items.  $C(x) = ?$
- (2) Let  $P(x)$  be the profit (in dollars) when the company produces and sells  $x$  items.  $P(x) = ?$
- (3) How many items should the company attempt to produce and sell? What is the largest profit that the company can make on this item?

P4. Refer to Group Project 1. Let  $P = (-6,2)$  and  $L: 3x + 4y - 60 = 0$ .

- (1) Let Q be the general point on L having X-coordinate  $x$ .  $Q = ?$  (Express the coordinates of Q in terms of  $x$ .)
- (2) Let  $f(x) = d^2$ , where  $d$  is the distance from P to Q. Simplify the expression for  $f(x)$ .
- (3) For what  $x$  is  $f(x)$  smallest?
- (4) Explain briefly why this does or does not surprise you in terms of your group project.

**CONTINUED ON THE BACK OF THIS SHEET.**

P5. For each of the following, compute  $(f \circ g)(x)$  and  $(g \circ f)(x)$ . Simplify.

(1)  $f(x) = 2x^2 - 4x + 3$  and  $g(x) = 3 - x$  .

(2)  $f(x) = \frac{x}{x+1}$  and  $g(x) = \frac{1}{x+3}$  .