

Math 141 - Parabolas Homework

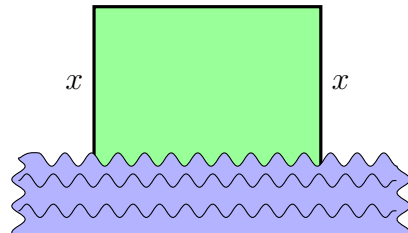
1. Find the vertex of each of the following parabolas.

(a) $x^2 + 2x - 15$

(b) $3x^2 - 9x + 10$

(c) $-2x^2 + 28x - 98$

2. Draw a rough sketch of each of the parabolas in the last exercise.
3. Find an equation for the secant line that intersects the parabola $y = x^2 - 3x + 2$ when $x = 3$ and when $x = 5$.
4. Find a formula for the slope of a secant line that intersects the parabola $y = x^2$ at the points $x = a$ and $x = 4$. Can you simplify this formula?
5. Farmer Brown would like to fence off a rectangular plot of land next to a river. The river will be the boundary for one of the sides of the rectangle, but he will need to build a fence along the other three sides. Suppose that he had enough materials to build 180 yards of fence. What is the largest area that he can fence off? Hint: Let x represent the length of the two sides that are perpendicular to the river. Find the area A as a function of x .



6. A ball thrown straight up in the air at 20 meters per second will have a height h that is a function of time t in seconds. The formula for the height is:

$$h(t) = 20t - 9.8t^2.$$

- (a) When does the ball reach its maximum height?
- (b) How high is the ball when it reaches its maximum height?
- (c) What is the average velocity between the time when it is thrown and the time when it reaches its maximum height? In other words, what is the average velocity of the ball on its way up?
7. **Extra credit** Use the substitution $u = x + \frac{b}{2a}$ to derive a formula for the roots of a quadratic polynomial $ax^2 + bx + c$.