HOMEWORK-WEEK 7

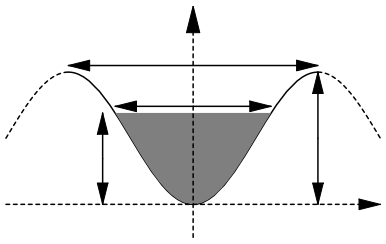
1. Stewart, section 3.8: #3-11(odd), 39, 40, 43.

2. Stewart, section 3.10: #7, 9, 13, 19, 23, 31, 34, 37, 38.

3. Assume that the height y of the river bed above its lowest point is given by a formula of the form

$$y = f(x) = A \sin\left(\frac{2\pi}{B}(x - C)\right) + D,$$

where x is the number of feet measured horizontally from the lowest point of the river bed. The river bed is 20 ft deep at its center and measures 40 ft across (see the figure).



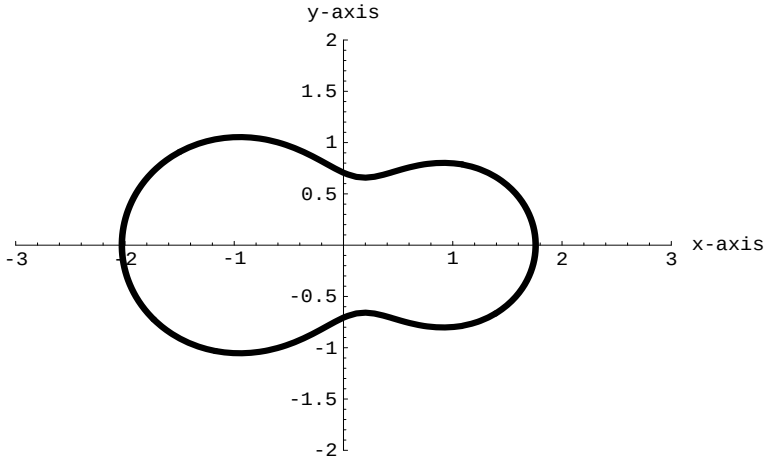
(a) Suppose that the river bed is partially filled with water. Let h be the depth of the water at the deepest point of the river (measured in feet) and let w be the width of the river (see figure). Find a formula relating h and w. Be sure to evaluate all constants in your formula.

(b) Suppose that on a certain day $w = 30$ ft and that h is increasing at a rate of 1 inch a day (1 ft = 12 inches). At what rate (in ft/day) is w increasing?

4. Given the equation

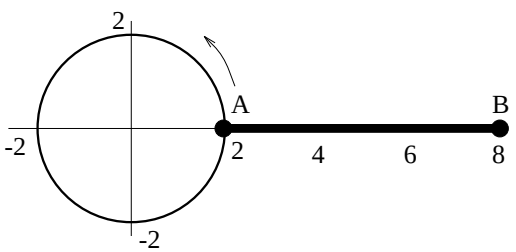
$$\frac{1}{(-1+x)^2+y^2}+\frac{2}{(1+x)^2+y^2}=2,$$

the graph is below:

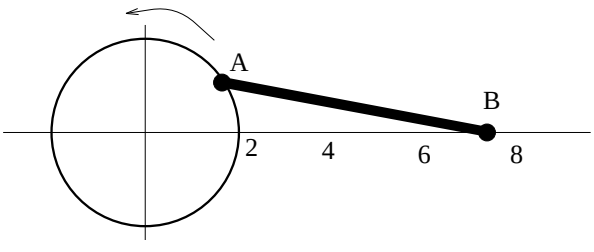


Find the y-intercepts. Use implicit differentiation to find the equations of the tangent lines at the y-intercepts.

5. A six foot long rod is attached at one end A to a point on a wheel of radius 2 feet, centered at the origin. The other end B is free to move back and forth along the x-axis. The point A is at $(2,0)$ at time $t=0$, and the wheel rotates counterclockwise at constant speed with an angular speed of 3 revolutions per minute. Find the acceleration of B when its velocity is zero.



time t=0



time t > 0

6. Assume the rod-wheel situation in the previous problem. Determine when the rod will be tangential to the wheel.