Math 2250, Spring 2017, Practice Sheet for Exam 2

---

(1) Find the derivative of the function

$$f(x) = \frac{x^x(x^2-4)^5(x-1)^3}{e^x\sqrt{x+e^x}}$$

(2) Solve for $\frac{dy}{dx}$ given that

$$x^2 - 4y^2 = \sin(xy)$$

(3) Solve for $\frac{dx}{dt}$ given that

$$e^{xy} + \ln(x+y) = y$$

(4) Given that

$$x + 3y - \sin(y) = 17, \text{ and } \frac{dy}{dt} = 3$$

solve for $\frac{dx}{dt}$ when $y = 0$.

(5) Water is draining from a cylindrical tank with a radius of 100cm at a constant rate of 20cm^3/min. Find the rate of change of the height of the water in the tank when the water's height is 500cm.
Recall that the formula for the volume of a cylinder is given by $V = \pi r^2 h$, where r is the radius and h is the height

(6) Water is in a conical tank with a height of 800cm and radius at the top of 300cm. If the water is draining out at a constant rate of 20cm^3/min, find the rate of change of the height of the water in the tank when the water's height is 100cm.
Recall that the formula for the volume of a circular cone is given by $V = \frac{1}{3}\pi r^2 h$, *where* r *is the radius and* h *is the height*

(7) Water is draining from a cylindrical tank with a radius of 100cm at a rate inversely proportional to the amount of water in the tank given by the formula:

$$\frac{dV}{dt} = -1/10V$$

where V is the volume of the tank in cc's (cubic centimeters), and where the speed is given in cc/sec. Find the rate of change of the height of the water in the tank when the water's height is 500cm.

(8) Consider the function $f(x) = x(6 - 2x)^2$.
- (a) Find all the critical points of $f(x)$
- (b) Find the intervals on which $f(x)$ is increasing or decreasing
- (c) Find all local minima and maxima
- (d) Find all absolute minima and maxima

(9) Suppose that we have functions $f(x), g(x)$ such that

$$f(g(x)) - 3g(x) + 2f(x + f(x)) = 9x.$$

Solve for $g'(x)$.