

**Mathematics 0110A: Introductory Calculus (002)**  
**2nd Homework**  
**Due Monday, November 5th, in class**

1. Find the 2nd derivative of these functions:

$$f(x) = x^2(x^3 + 5x - 4)^3, \quad g(x) = \frac{\sqrt{x-1}}{x^2-1}, \quad y^3 - xy = 8 \quad (\text{find } \frac{d^2y}{dx^2}).$$

2. Find the equation of the tangent line to the graph described by the following equation at point  $(2, -1)$ :

$$x^3(x^2 + 1)y^3 + xy + \sqrt[3]{y} = -43.$$

3. The perimeter of a circle is increasing at the rate of  $10 \text{ cm/sec}$ . How fast is its area increasing when the radius is equal to  $5 \text{ cm}$ ? (The perimeter of a circle of radius  $r$  is equal to  $2\pi r$  and its area is equal to  $\pi r^2$ .)

4. Simplify the following expressions:

$$\left(\frac{x^5 y^2}{x^{1/2} y^6}\right)^{1/3}, \quad \log \frac{\sqrt{x(x^2+1)}}{10(x+1)^2}, \quad \ln \frac{e^{3x}}{e^x + 5}.$$

5. Solve the following equations for  $x$ , and if there is no solution explain why:

$$2e^{4x+5} + 3 = 8, \quad 4\left(\frac{1}{2}\right)^{x^2+x} + 5 = 1, \quad 2 \log_3 \sqrt{2-x} + \log_3(1-x) = \log_3 6.$$

6. Find the derivative  $\frac{dy}{dx}$  of the following functions:

$$y = xe^{x^2+1}, \quad y = (x^2 + 2x)3^{2x}, \quad y = x^2 \ln(x^3 + 2x), \quad y = \frac{\log_{1/2} x^2}{x^2 + 1}.$$