MAT270 Exam 2 Review

Fall 2013

This is in no way a complete list of topics covered in class, but merely a compilation of the types of exercises commonly encountered.

1. Use the definition of the limit definition of the derivative to determine the tangent line to the curve $y = f(x)$ at the given point P.

a. $f(x) = 4x^2 - 7x + 5;\ P(2,7)$

b. $f(x) = \dfrac{x+3}{2x+1};\ P(0,3)$

2. Evaluate and simplify the derivative in the following functions.

a. $\dfrac{d}{dx}\left[\dfrac{2}{3}x^3 + \pi x^2 + 7x + 1\right]$

b. $\dfrac{d}{dx}\left[xe^{-10x}\right]$

c. $\dfrac{d}{dx}\left[x^{\sin(x)}\right]$

d. $\dfrac{d}{dx}\left[\tan^{-1}(e^{-x})\right]\Big|_{x=0}$

e. $\dfrac{d}{dx}\left[x\sec^{-1}(x)\right]\Big|_{x=2/\sqrt{3}}$

f. $\dfrac{d}{dx}\left[\log_3(x+8)\right]$

g. $\dfrac{d}{dx}\left[x\ln(x)\right]$

h. $\dfrac{d}{dx}\left[\dfrac{x^2\sin(x)}{e^x}\right]$

3. Calculate $\dfrac{dy}{dx} = y$ for the following curves.

a. $y = \dfrac{e^y}{1+\sin(x)}$

b. $\sin(x)\cos(y-1) = \dfrac{1}{2}$

c. $y\sqrt{x^2+y^2} = 15$

4. Find the equation of the line tangent to the curve at the given point P.

a. $y + \sqrt{xy} = 6;\ P(x, y) = (1, 4)$

b. $x^2y + y^3 = 75;\ P(x, y) = (4, 3)$

5. Consider the following functions. In each case, without finding the inverse, evaluate the derivative of the inverse at the given point.

a. $f(x) = \dfrac{1}{x+1};\ f(0)$

b. $f(x) = x^4 - 2x^2 - x;\ f(0)$

6. Water flows into a conical tank at a rate of 2 ft^2/min. If the radius of the top of the tank is 4 ft and the height is 6 ft, determine how quickly the water level is rising when the water is 2 ft deep in the tank.

7. Two boats leave a dock at the same time. One boat travels south at 30 mi/hr and the other travels east at 40 mi/hr. After half an hour, how fast is the distance between the boats increasing?

8. Find the critical points of the following functions on the given intervals. Identify the absolute maximum and minimum values (if possible).

a. $f(x) = \sin(2x) + 3;\ [-\pi, \pi]$

b. $f(x) = 2x^3 - 3x^2 - 36x + 12;\ (-\infty, \infty)$

c. $f(x) = 2x\ln(x) + 10;\ (0, 4)$

d. $f(x) = x^{1/3}(9 - x^2);\ [-4, 4]$