PRACTISE EXERCISES FOR TEST 3 - MATH 103DW

3.6 (Implicit Differentiation)

5.5 (Differentiation Involving Logarithms)

4.1 (Applications of 1st Derivative)

4.2 (Applications of 2nd Derivative)

4.3 (Curve Sketching) BONUS

(1) Find dy/dx

a- $2x^2 - y^2 = 3$

b- $xy^2 + y = 5$

c- $\sin(xy) = 1$

d- $e^{x+y} = 3 + x$

e- $x^2 \ln y = y$

f- $\sqrt{x} - 2xy = 16$

g- $x^3 y - xy = 2$

h- $y\cos(x+y) = x$

i- $\ln(x^2 y^2) = \frac{x^2}{2}$

j- $x^2 e^y + x = y$

(2) Find the equation of the tangent line to the curve at the given point.

a- $\ln(xy) + x = y^2$ at the point $(1, 1)$

b- $x^3 y^2 - 3xy = -2$ at the point $(1, 2)$

c- $f(x) = 4 - x^2 - \ln(\frac{1}{2}x + 1)$ at the point $(0, 4)$

d- $f(x) = x^3 \ln x$ at the point $(1, 0)$

e- $y^2 e^{xy} = 2y + x$ at the point $(0, 1)$

(3) Find dy^2/d^2x (your answer should be in terms of x and y only)

a- $x^2 + y^2 = 25$

b- $y^2 = x^3$

c- $1 - xy = x - y$

d- $y^2 = 4x$

(4) Find the derivative (your answer should be in terms of x only)

a- $y = \ln(x^2 + 1)$

b- $f(x) = \ln(\ln x)$

c- $y = \ln(\cos^2 x)$

d- $y = \ln \frac{x(x-1)^{\frac{3}{2}}}{\sqrt{x+1}}$

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

f- $y = x^2 \ln(x^2)$

g- $f(x) = \sin(2x) \ln(x^2)$

h- $y = (x+1)^x$

i- $y = x^{\cos x}$

j- $y = (\ln x)^x$

k- $y = \ln(x^x)$

(5) Find the points on the curve of the function where the tangent line is horizontal.

a- $f(x) = -\frac{1}{8}(x+2)^2(x-4)^2$

b- $f(x) = \frac{x}{x^2+1}$

(6) Find all relative extrema of the function.

a- $f(x) = \frac{x+3}{x^2}$

b- $f(x) = 2x^3 + 3x^2 - 12x$

c- $f(x) = x\sqrt{16 - x^2}$

d- $f(x) = \frac{x^5 - 5x}{5}$

(7) Find the relative extrema, the intervals where the function is increasing/decreasing, the inflection points, the intervals where the function is concave up/down. (Bonus, sketch the graph indicating intercepts as well)

a- $f(x) = x^2(6-x)^2$

b- $f(x) = x^3 - 9x^2 + 27$

c- $f(x) = x^3(x-4)$

d- $f(x) = x^3 - 6x^2 + 12x$

e- $f(x) = 2x^4 - 8x + 3$

f- $f(x) = (x-1)^{\frac{1}{3}}$

g- $f(x) = x^{\frac{2}{3}} - 4$

h- $f(x) = \frac{1}{4}x^4 - 2x^2$

i- $f(x) = x^4 - 4x^3 + 2$

j- $f(x) = -(x-5)^2$