Calculus I. Summer 17 Test 2 Review.
Make sure you also study all the quizzes, then notes and homework examples!

Overview of Derivatives

Power Rule: $y = x^2$, $7x^{-3}$, $\sqrt[5]{x^7}$, $x^{\sqrt{3}}$.

Trig: $y = \sin x$, $\cos x$, $\tan x$, $\sec x$, $\csc x$, $\cot x$, $\sin^{-1} x$, $\cos^{-1} x$, $\tan^{-1} x$.

Hyperbolic Trig: $y = \sinh x$, $\cosh x$, $\tanh x$.

Exponential: $y = e^x$, 3^x, $(\ln 2)^x$.

Logs: $y = \ln x$, $\log_5 x$, $\log_{2\pi} x$.

Combining functions: sums, products, quotients, compositions.

Find y' using implicit differentiation and logarithmic differentiation.

1. Find y'. Don't simplify.

a) $y = \dfrac{x^4 - \sqrt{x}}{\sin 3x}$

b) $y = \dfrac{1}{\sqrt[7]{t^5}}$

c) $y = e^p \cosh^3(2^p)$

d) $y = \sec(\log_2(x))$

e) $y = \dfrac{\tan x}{e^x - \sqrt{x}}$

f) $x3^y = (x+1)y$

g) $xy = \csc y$

h) $y = x^{(\frac{5}{x})}$

i) $y = \sin(x^{(\frac{5}{x})})$

j) $y = \sin^{-1}(2^r)$

2. Find the tangent slope to $y = \frac{7^x}{\sin(e^x)}$ at $x = 3$.

3. Find the tangent line to the curve given by $xy + y = 7^x$ at $(x, y) = (0, 1)$.

4. Find the linearization $L(x)$ to $f(x) = x^3 + 4x$ at $x_1 = 1$. Use it to approximate $f(1.01)$. Also give the differentials dx and dy.

5. Estimate $\ln(1.01)$ using linearization.

6. Let the functions $f(x)$ and $g(x)$ be given such that $f(2) = 1,\ \ f'(2) = 3,\ \ g(2) = -1,\ \ g'(2) = 5$.

   a) If $y = f(x)g(x) + g(x) - \dfrac{g(x)}{f(x)}$ find the value of the derivative y' at $x = 2$.

   b) If $y = \sin(\pi g(x))$ find the value of the derivative y' at $x = 2$.

7. A particle is moving along the curve given by $xy = y^2e^{(x-1)}$. At the point (1,1) the x-coordinate is increasing at the rate 5 m/s. Find the rate of change in the y-coordinate.

8. A light on a 3 ft pole shines on a 1 inch mouse running away at 2 ft/s. How fast is the tip of the mouse shadow moving when it is 4 ft away?

9. A cylindrical tank with radius 5 m is being filled at a rate of 3 m^3/min. How fast is the height of the water increasing?