9/24/21

Worksheet #2

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Instructions: Put the first and last name of everyone in your workgroup at the top of your paper. Everyone is to do their own worksheet but only one from each group is graded with the score shared. Be sure to show your work and explain your reasoning.

1. Find equations of the tangent line and normal line to the curve at the given point.

(a).

$y = x^4 + 2e^x, (1, 1 + 2e)$

(b).

$y = \sqrt{x}e^x, (1, e)$

(c).

$y = sin(x) + cos(x), (0, 1)$

(d).

$y = 2^x, (0, 1)$

2. If f is a differentiable function, find an expression for the derivative of each of the following functions.

(a).

$y = x^3 f(x)$

(b).

$y = \dfrac{f(x)}{x^3}$

(c).

$y = \dfrac{x^3}{f(x)}$

(d).

$$y = \frac{1 + xf^2(x)}{\sqrt{x}}$$

3. Find Q'(0) where

$$Q'(0) = \frac{1 + x + x^2 + xe^x}{1 - x + x^2 - xe^x}$$

4. Find $F'(t)$ and $F''(t)$

$$F(t) = e^{tsin(2t)}$$

5. Find the limit

(a).

$$lim_{x \to 0} \frac{sin5x}{3x}$$

(b).

$$lim_{\theta \to 0} \frac{cos\theta - 1}{sin\theta}$$

Hint : You can refer to textbook page 192

(c).

$$\lim_{x \to 0} \frac{\sin(3+x)^2 - \sin 9}{x}$$

6. Find the derivative of the functions

(a).

$$f(x) = (x+1)^2(x^3 + x^2 + 1)^3$$

(b).

$$f(x) = \frac{\sin^2 x}{1 + \cot x} + \frac{\cos^2 x}{1 + \tan x}$$

hint: $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$, try to simplify it first

7. If n is a positive integer, prove that

$$\frac{d}{dx}\left(sin^n x \cos nx\right) = nsin^{n-1}x \cos(nx + x)$$