Math 131 - Quiz 3 (IC)

Name key

September 29, 2021

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (2 points) Determine the derivative of each function.

(a) $f(x) = 7x^3 - \frac{5}{x} + \sqrt{x}$ $= 7x^3 - 5x^{-1} + x^{1/2}$

$f'(x) = 21x^2 + 5x^{-2} + \frac{1}{2}x^{-1/2}$

$= 21x^2 + \frac{5}{x^2} + \frac{1}{2\sqrt{x}}$

(b) $y = 2x^{1/3} \cdot \cos x$ PRODUCT RULE

$\frac{dy}{dx} = \frac{2}{3}x^{-2/3}\cos x - 2x^{1/3}\sin x$

2. (1 point) Use your result from part (a) above and find an equation of the line tangent to the graph of f at $x = 1$.

SLOPE: $m = f'(1) = 21 + 5 + \frac{1}{2} = 26\frac{1}{2} = \frac{53}{2}$

POINT: $x = 1$

$y = f(1) = 7 - 5 + 1 = 3$

$(1, 3)$

TANGENT LINE:

$y - 3 = \frac{53}{2}(x - 1)$

or

$y = \frac{53}{2}x - \frac{47}{2}$

Math 131 - Quiz 3 (TH)

Name key

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Score _____

Show all work to receive full credit. Supply explanations when necessary. This quiz is due October 4.

1. (4.5 points) Find the derivative of each function. Do not simplify.

   (a) $f(t) = t^{2/3} \sec t$

$$f'(t) = \frac{2}{3}t^{-1/3}\sec t + t^{2/3}\sec t \tan t$$

   (b) $y = \dfrac{x^2 + 4x}{\tan x}$

$$\frac{dy}{dx} = \frac{(2x+4)\tan x - (x^2+4x)\sec^2 x}{\tan^2 x}$$

   (c) $r = \theta + \dfrac{1}{\theta} + \dfrac{1}{\theta^2} = \theta + \theta^{-1} + \theta^{-2}$

$$\frac{dr}{d\theta} = 1 - \theta^{-2} - 2\theta^{-3} = 1 - \frac{1}{\theta^2} - \frac{2}{\theta^3}$$

Turn over.

2. (1.5 points) Find an equation of the line tangent to the graph of $y = x^2 + x + \sqrt{x}$ at the point where $x = 1$. Write your final answer in slope-intercept form.

$$\frac{dy}{dx} = 2x + 1 + \frac{1}{2}x^{-1/2}$$

$$m = \left.\frac{dy}{dx}\right|_{x=1} = 2 + 1 + \frac{1}{2} = 3.5 = \frac{7}{2}$$

Point: $x = 1 \Rightarrow y = 1 + 1 + 1 = 3$

$(1, 3)$

Tangent line:

$$y - 3 = \frac{7}{2}(x - 1)$$

or

$$y = \frac{7}{2}x - \frac{1}{2}$$

3. (1 point) Sketch the graph of a continuous function that is not differentiable at $x = -2$ and $x = 3$.

Sharp points or vert. tan. line.