Part 1: Skip this part if you have passed part 1.
Otherwise you must pass it for part 2 to be graded.

SOLUTIONS

Name: _____

1 point 1. Find $f'(x)$ if $f(x) = 5\left(x^3 - \cos x + \sqrt{x}\right)^{10}$

USE CHAIN RULE

$50\left(x^3 - \cos x + \sqrt{x}\right)^9 \left(3x^2 + \sin x + \frac{1}{2\sqrt{x}}\right)$

1. _____

1 point 2. Evaluate $\lim_{x\to 0} \frac{\cos(3x)}{3x+6}$ $= \frac{\cos(0)}{0+6} = \frac{1}{6}$

2. $\frac{1}{6}$

1 point 3. Evaluate $\lim_{h\to 0} \frac{3(x+h)^3 - 3x^3}{h}$.

DERIVATIVE OF $3x^3$

(OR MULTIPLY OUT, CANCEL, PLUG IN)

3. $9x^2$

1 point 4. Find $\frac{dy}{dx}$ if $y = \frac{5x^3 - e^4}{\pi + \ln x}$

QUOTIENT RULE:

$$\frac{(15x^2)(\pi + \ln x) - (5x^3 - e^4)\left(\frac{1}{x}\right)}{(\pi + \ln x)^2}$$

4. _____

1 point 5. Write the equation of the line tangent to $y = \ln x + \sin\left(\frac{\pi x}{2}\right)$ at $x = 1$.

AT $x=1$, $y = \ln 1 + \sin(\pi/2) = 0 + 1 = 1$

$\frac{dy}{dx} = \frac{1}{x} + \frac{\pi}{2}\cos\left(\frac{\pi x}{2}\right)$,

AT $x=1$, THIS IS $1 + \frac{\pi}{2}\cdot 0 = 1$.

LINE IS $y = 1 + (x-1)$

5. ie $y = x$

1 point 6. Compute the derivative with respect to t: $5t^5 - \frac{2t^2}{3} + \frac{5}{t} + \sin\left(\frac{\pi}{5}\right)$

REMEMBER, $\sin\left(\frac{\pi}{5}\right)$ IS A CONSTANT.

6. $25t^4 + \frac{4}{3}t - \frac{5}{t^2}$

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SOLUTIONS

Name: _____

1 point 7. Find the x-coordinate of the point of inflection of $g(x) = 4x^3 + 18x^2 - 9x + 5$.

$g'(x) = 12x^2 + 36x - 9$

$g''(x) = 24x + 36$.

$g''(x) = 0 \iff x = \frac{-36}{24} = \frac{-3}{2}$

7. $-\frac{3}{2}$

1 point 8. What is the largest interval on which $f(x)$ is increasing if $f(x) = -2x^3 - 12x^2 + 72x + 100$?

$f'(x) = -6x^2 - 24x + 72 = -6(x+6)(x-2)$

$f'(x) > 0$ FOR $-6 < x < 2$

8. $-6 < x < 2$

1 point 9. Find $P'(4)$ if $P(x) = \left(3\sqrt{x} - \cot\left(\frac{\pi x}{8}\right)\right)\left(\frac{x^2}{8} - 1\right)$.

$P'(x) = \left(\frac{3}{2\sqrt{x}} + \csc^2\left(\frac{\pi}{8}x\right)\cdot\frac{\pi}{8}\right)\left(\frac{x^2}{8} - 1\right) + \left(3\sqrt{x} - \cot\left(\frac{\pi}{8}x\right)\right)\left(\frac{x}{4}\right)$

$P'(4) = \left(\frac{3}{4} + 1\cdot\frac{\pi}{8}\right)\left(\frac{16}{8} - 1\right) + (6 - 0)(1) =$

9. $\frac{3}{4} + \frac{\pi}{8} + 6$

1 point 10. Compute $F'(t)$ if $F(t) = e^{\frac{10}{t}} + e^{10t}$.

CHAIN RULE

REMEMBER $\frac{10}{t} = 10t^{-1}$

10. $\frac{-10}{t^2}e^{10/t} + 10e^{10t}$

1 point 11. Find the x-coordinate of the local minimum of $8x^3 - 6x^2 - 12x + 5$. If there is none, write "None".

$f'(x) = 24x^2 - 12x - 12 = 12(2x+1)(x-1)$

$f''(x) = 24x - 12$

$f''(-\frac{1}{2}) < 0$, MAX $\quad f''(1) > 0$, MIN

11. $x = 1$

1 point 12. Compute the derivative of $\frac{\cos(10x)}{7} - \arcsin(10x)$.

CHAIN RULE

$\frac{-\sin(10x)}{7}\cdot 10 - \frac{1}{\sqrt{1+(10x)^2}}\cdot 10 =$

12. $\frac{-10\sin(10x)}{7} - \frac{10}{\sqrt{1-100x^2}}$