1. (1 point)
Find the derivative of $f(x) = 4.15^{\cos x}$
$f'(x) =$ ______________________
Answer(s) submitted:

-

(incorrect)

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2. (1 point) Find $\frac{d}{dx}\left(\frac{e^{4x}\sqrt{x^2+4}}{\arccos^7(x)}\right)$.
Answer: __________
Answer(s) submitted:

-

(incorrect)

---

3. (1 point) Find $\frac{dy}{dx}$, if
$$8x^4y^3 - 2x^2y^2 = 4.$$

$\frac{dy}{dx} =$ __________

Answer(s) submitted:

-

(incorrect)

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4. (1 point) Let $f(x) = x^{8x}$.
$f'(x) =$ ______________________
Answer(s) submitted:

-

(incorrect)

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5. (1 point) Find $\frac{dy}{dx}$ at (4,2) if $x^y = y^x$.
Ans:________
Answer(s) submitted:

-

(incorrect)

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6. (1 point)
Let $f(x) = (4-4x)^{-1/2}$. Compute the following.

$f(0) =$ ________

$f'(0) =$ ________

$f''(0) =$ ________

$f'''(0) =$ ________

Answer(s) submitted:

-
-
-
-

(incorrect)

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7. (1 point)
Find a formula for $f^{(101)}(x)$ if $f(x) = \frac{1}{6x-1}$.
$f^{(101)}(x) =$ __________
Answer(s) submitted:

-

(incorrect)

10. (1 point) Let $f(x) = \ln x$ for $x > 0$.

Since $f(x)$ is continuous on $[1, 1.02]$ and differentiable on $(1, 1.02)$, by mean value theorem, there exists $c \in (1, 1.02)$ such that

to f(1.02)-f(1)$\frac{}{1.02-1 = f'(c)\,\frac{\ln(1.02)}{1.02-1} = \frac{1}{c}}$

Since $1 < c < 1.02$, we have

$\_\_\_\_\_\_\_\_ < \frac{1}{c} < \_\_\_\_\_\_\_\_$.

Therefore,

$\_\_\_\_\_\_\_\_ < \ln(1.02) < \_\_\_\_\_\_\_\_$.

It gives an estimation of $\ln(1.02)$.

Answer(s) submitted:

-
-
-
-

(incorrect)

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11. (1 point)

Find the limit. Use l'Hospital's Rule if appropriate. Use INF to represent positive infinity, NINF for negative infinity, and D for the limit does not exist.

$\lim_{x \to 0} \frac{10 \sin x - 10x}{-6x^3} = \_\_\_\_\_\_\_\_$

Answer(s) submitted:

-

(incorrect)

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12. (1 point)

Apply L'Hôpital's Rule to evaluate the following limit. It may be necessary to apply it more than once.

$\lim_{x \to e} \frac{1 - \frac{x}{e}}{e - x} = \_\_\_\_\_\_\_\_$

Answer(s) submitted:

-

(incorrect)

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13. (1 point)

Find $\lim_{x \to 0^+} (\sin 6x)^x$.

Answer: __________

Answer(s) submitted:

-

(incorrect)

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14. (1 point)

Let $f(x) = x^2 \sin\left(\frac{1}{x}\right)$ and let $g(x) = \sin x$.

By considering $\frac{x^2 \sin\left(\frac{1}{x}\right)}{\sin x} = \frac{x}{\sin x} \cdot \left[x \sin\left(\frac{1}{x}\right)\right]$,

$\lim_{x \to 0} \frac{x^2 \sin\left(\frac{1}{x}\right)}{\sin x} = \_\_\_\_\_\_\_\_$.

Note that $\lim_{x \to 0} \frac{f(x)}{g(x)} = \lim_{x \to 0} \frac{x^2 \sin\left(\frac{1}{x}\right)}{\sin x}$ is of the indeterminate form $\frac{0}{0}$.

Therefore, we try to compute the above limit by using L'Hoptial's rule:

$\lim_{x \to 0} \frac{f'(x)}{g'(x)} = \lim_{x \to 0} \_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_$.

(Write "undefined" if the limit does not exist.)

8. (1 point) Find the local linear approximation of the function $f(x) = \sqrt{7+x}$ at $x_0 = 18$, and use it to approximate $\sqrt{24.9}$ and $\sqrt{25.1}$.

(a) $f(x) = \sqrt{7+x} \approx$ ☐

(b) $\sqrt{24.9} \approx$ ☐

(c) $\sqrt{25.1} \approx$ ☐

For parts (b) and (c), you should enter your answer as a fraction. If you enter a decimal, make sure that it is correct to at least six decimal places.

9. (1 point) Consider the function $f(x) = 1 - 7x^2$ on the interval $[-5, 6]$.
(A) Find the average or mean slope of the function on this interval, i.e.

$$\frac{f(6) - f(-5)}{6 - (-5)} = \square$$

(B) By the Mean Value Theorem, we know there exists a c in the open interval $(-5, 6)$ such that $f'(c)$ is equal to this mean slope. For this problem, there is only one c that works. Find it.

c = ☐

15. (1 point) Fill in the **definition** of "relative rates of growth" below.

Suppose that $\lim_{x\to\infty} f(x) = \infty$ and $\lim_{x\to\infty} g(x) = \infty$.

We say that f *grows faster than* g, written $f \gg g$ if

$$\lim_{x\to\infty} \frac{g(x)}{f(x)} = \square$$

which is equivalent to saying

$$\lim_{x\to\infty} \frac{f(x)}{g(x)} = \square$$

Below, arrange the functions in order of increasing rate of growth.

(Place faster growing functions above slower growing functions).

Choose from these	Place functions here (drag and drop)
$\ln(x)$	
x	
$\sqrt{x}$	
x^2	
e^x	