

*SHOW WORK and JUSTIFY your answer to all parts using appropriate calculus! NO CALCULATORS!!*

1. Determine if the following limit exists. If it doesn't exist, say where the limit tends if possible.

5 pts.

$$\lim_{x \rightarrow 1^+} \frac{1}{\sqrt{x-1}}$$

Answer:  $\lim_{x \rightarrow 1^+} \frac{1}{\sqrt{x-1}}$

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2. Given that  $f$  is a differentiable function, determine a formula for the derivative of  $\frac{1}{f(x)}$ .

5 pts.

$$\left( \frac{1}{f(x)} \right)' = \underline{\hspace{2cm}}$$

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3. Differentiate each of the following functions using the appropriate rules. DO NOT SIMPLIFY YOUR ANSWERS.

10 pts.

A)  $f(x) = \sqrt{3-4x^6}$

$$f'(x) = \underline{\hspace{2cm}}$$

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B)  $f(x) = x(3x^2 + 1)^9$

$$f'(x) = \underline{\hspace{2cm}}$$

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4) Given that  $f$  and  $g$  are differentiable functions, give a formula for the derivative of  $x^2 f(g(x))$ .

10 pts.

Answer:

$$\frac{d}{dx}(x^2 f(g(x))) = \underline{\hspace{2cm}}$$

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5) Given the equation  $xy^2 + 3x^2 = 4$ , use implicit differentiation to find  $\frac{dy}{dx}$ .

5 pts.

Answer:  $\frac{dy}{dx} = \underline{\hspace{2cm}}$