

Honors Pre-Calc
10.1-10.3 Review

Name _____
Date _____ Block _____

- 1.) Define derivative:
 a.) slope of tangent *equation to find*
 b.) instantaneous rate of change
 c.) $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$
- 2.) What conditions would cause a limit to not exist?
 a.) Approaching 2 different #'s from left/right
 b.) Not approaching a unique #
 c.) Oscillation between two values.

Create a table of values and use it to determine the limit.

3.) $\lim_{x \rightarrow 1} \ln(7-x)$

2.0794

4.) $\lim_{x \rightarrow 0} \frac{\sin x}{2x^2 - x}$

-1

5.) $\lim_{x \rightarrow 0} \frac{e^x - \sqrt{x}}{\log_4(x+2)}$

~~2~~ $\sqrt{\text{DNE}}$

Doesn't approach from left

Find the limit analytically, using direct substitution, rationalizing, or dividing (factor & cancel).

6.) $\lim_{x \rightarrow 2} (x-4)^{\frac{2}{3}}$

3.3019

7.) $\lim_{x \rightarrow 0} \frac{\sqrt{x+10} - \sqrt{10}}{x} \cdot \frac{\sqrt{x+10} + \sqrt{10}}{\sqrt{x+10} + \sqrt{10}}$

$\lim_{x \rightarrow 0} \frac{x+10-10}{x(\sqrt{x+10} + \sqrt{10})} = \frac{1}{2\sqrt{10}}$

8.) $\lim_{x \rightarrow \frac{\pi}{2}} \sin(3x)$

-1

9.) $\lim_{x \rightarrow 2} \frac{\frac{1}{x+2} - \frac{1}{4}}{x-2}$

$\lim_{x \rightarrow 2} \frac{4 - (x+2)}{4(x+2)} \cdot \frac{1}{(x-2)}$

~~$\lim_{x \rightarrow 2} \frac{4 - (x+2)}{4(x+2)(x-2)}$~~

$\lim_{x \rightarrow 2} \frac{2-x}{4(x^2-4)} = \frac{-1(x+2)}{4(x+2)(x-2)} = \frac{-1}{16}$

10.) $\lim_{x \rightarrow \infty} \frac{3x^2 - 12}{7x^2 + 5}$

$\frac{3}{7}$

11.) $\lim_{x \rightarrow 2} \frac{x^2(x+2) + 11(x+2)}{x^3 - 2x^2 + x - 2}$

$\lim_{x \rightarrow 2} (x^2 + 1) = 5$

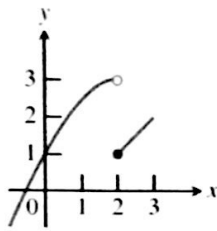
Find each limit or value.

2.) a.) $\lim_{x \rightarrow 2^-} f(x) = 3$

b.) $\lim_{x \rightarrow 2^+} f(x) = 1$

c.) $\lim_{x \rightarrow 2} f(x) = \text{DNE}$

d.) $f(2) = 1$

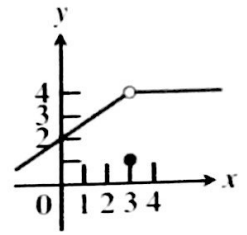


13.) a.) $\lim_{x \rightarrow 3} f(x) = 4$

b.) $\lim_{x \rightarrow 3^+} f(x) = 4$

c.) $\lim_{x \rightarrow 3^-} f(x) = 4$

d.) $f(3) = 1$



Find the derivative using limits.

14.) $f(x) = \frac{1}{\sqrt{x-9}}$

15.) $y = 3x^3 - 9x$

16.) $f(x) = \frac{5}{x^2}$

~~$$\lim_{h \rightarrow 0} \frac{\frac{1}{\sqrt{x+h-9}} - \frac{1}{\sqrt{x-9}}}{h}$$~~
~~$$\frac{\sqrt{x-9} - \sqrt{x+h-9}}{\sqrt{x+h-9}\sqrt{x-9}} \cdot \frac{1}{h}$$~~

See paper

See paper

Find the equation of a tangent line of each function at the indicated point.

17.) $f(x) = 3x^2 + 2x; x = -2$

18.) $f(x) = x + 2\cos x; f'(x) = 1 - 2\sin x; x = \frac{\pi}{4}$

$$\lim_{h \rightarrow 0} \frac{3(x+h)^2 + 2(x+h) - 3x^2 - 2x}{h}$$

$$f'(\frac{\pi}{4}) = 1 - 2(\frac{\sqrt{2}}{2})$$

$$\lim_{h \rightarrow 0} \frac{3x^2 + 6xh + 3h^2 + 2x + 2h - 3x^2 - 2x}{h}$$

$$f'(\frac{\pi}{4}) = 1 - \sqrt{2} \quad (\frac{\pi}{4}, \frac{\pi}{4} + \sqrt{2})$$

$$\lim_{h \rightarrow 0} 6x + 3h + 2$$

$$y = -10x - 12$$

$$m = -10$$

$$(-2, 8)$$

$$y - (\frac{\pi}{4} + \sqrt{2}) = (1 - \sqrt{2})(x - \frac{\pi}{4})$$

$$f'(x) = 6x + 2$$

$$f'(-2) = -10$$

$$y - 8 = -10(x + 2)$$

$$y = -10x - 12$$

Use the function and its derivative to determine any points on the graph of at which the tangent line is horizontal.

19.) $f(x) = x \ln x; f'(x) = \ln x + 1$

20.) $f(x) = \frac{1}{3}x^3 - \frac{3}{2}x^2; f'(x) = x^2 - 3x$

$$\ln x + 1 = 0$$

$$\ln x = -1$$

$$\log_e x = -1$$

$$e^{-1} = x$$

$$x^2 - 3x = 0$$

$$x(x - 3) = 0$$

$$x = 0 \quad x = 3$$

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$$\lim_{h \rightarrow 0} \frac{\frac{1}{\sqrt{x+h-9}} - \frac{1}{\sqrt{x-9}}}{h}$$

$$\lim_{h \rightarrow 0} \frac{\sqrt{x-9} - \sqrt{x+h-9}}{\sqrt{x+h-9} \cdot \sqrt{x-9}} \cdot \frac{\sqrt{x-9} + \sqrt{x+h-9}}{\sqrt{x-9} + \sqrt{x+h-9}}$$

$$\lim_{h \rightarrow 0} \frac{x-9 - \sqrt{x-9} \sqrt{x+h-9}}{\sqrt{x+h-9} \cdot \sqrt{x-9} \cdot (\sqrt{x-9} + \sqrt{x+h-9})} \cdot \frac{1}{h}$$

$$\lim_{h \rightarrow 0} \frac{-1}{(x-9) \cdot 2\sqrt{x-9}}$$

$$= \frac{-1}{2(x-9)^{3/2}}$$

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$$\lim_{h \rightarrow 0} \frac{3(x+h)^3 - 9(x+h) - 3x^3 + 9x}{h}$$

$$\lim_{h \rightarrow 0} \frac{3(x^3 + 3x^2h + 3xh^2 + h^3) - 9x - 9h - 3x^3 + 9x}{h}$$

$$\lim_{h \rightarrow 0} \frac{\cancel{3x^3} + 9x^2h + 9xh^2 + 3h^3 - \cancel{9x} - 9h - \cancel{3x^3} + \cancel{9x}}{h}$$

$$\lim_{h \rightarrow 0} 9x^2 + 9xh + 3h^2 - 9$$

$$= 9x^2 - 9$$

$$(16) \lim_{h \rightarrow 0} \frac{\frac{5}{(x+h)^2} - \frac{5}{x^2}}{h}$$

$$\lim_{h \rightarrow 0} \frac{5x^2 - 5(x+h)^2}{x^2(x+h)^2} \rightarrow \frac{5x^2 - 5(x^2 + 2xh + h^2)}{x^2(x+h)^2} = \frac{5x^2 - 5x^2 - 10xh - 5h^2}{x^2(x+h)^2}$$

$$\lim_{h \rightarrow 0} \frac{-10xh - 5h^2}{x^2(x+h)^2} \cdot \frac{1}{h}$$

$$\lim_{h \rightarrow 0} \frac{-10x - 5h}{x^2(x+h)^2} = \frac{-10x}{x^2 \cdot x^2} = \frac{-10}{x^3}$$