1. Which of the following is not a condition for the existence of a limit of $f(x)$ at x = 3

A) the left limit as x→3 exists.

B) $\lim_{x\to 3^+} f(x)$ exists

C) $f(3)$ exists.

D) the left and right limits are equal.

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2. Fill in the blank to make the function continuous.

A) 3 B) -13 C) 13 D) -3

$$f(x) = \begin{cases} \dfrac{x^2 - 7x - 30}{10 - x} & x \neq 10 \\ \underline{\ -13\ } & x = 10 \end{cases}$$

$$\frac{(\cancel{x-10})^{-1}(x+3)}{\cancel{10-x}}$$

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3. Given $\lim_{x\to 5} f(x) = 2$ and $\lim_{x\to 5} g(x) = -5$ then

A) $\lim_{x\to 25}\left(g(x)\bullet f(x)\right) = -10$

B) $\lim_{x\to 10}\left(g(x)\bullet f(x)\right) = -10$

C) $\lim_{x\to 5}\left(g(x)\bullet f(x)\right) = -10$

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4. The function $f(x) = \sqrt{2-x}$ is defined on:

A) $x \in \Re$ B) $x \leq 2$ C) $x < 2$ D) Nowhere

CONTINUOUS

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5. The graph of $y = x - 3,\ x \neq 3$ is identical to

A) y = x - 3

B) y = x - 3 & the point (3, 0)

C) $y = \dfrac{(x-3)^2}{x-3}$

D) $y = \dfrac{(x^2-9)}{x-3}$

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6. Why is $\lim_{x \to 0} 4\sqrt{x} = 0$ an incorrect statement?
Be specific.

NO LEFT LIMIT,

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7. Evaluate

(g)

$$\lim_{x\to 0}\frac{x}{\sqrt{3+4x}-\sqrt{6x+3}} \times \frac{\sqrt{3+4x}+\sqrt{6x+3}}{\sqrt{3+4x}+\sqrt{6x+3}}$$

$$\lim_{x\to 1}\left(\frac{2}{x-1}\right)\left(\frac{1}{x+3}-\frac{2}{3x+5}\right)$$

$$\lim_{x\to 0}\frac{\cancel{x}\left(\sqrt{3+4x}+\sqrt{6x+3}\right)}{-2\cancel{x}\;\cancel{(3+4x)-(6x+3)}}$$

$$\lim_{x\to 0}\frac{\sqrt{3+4x}+\sqrt{6x+3}}{-2}$$

$$=\frac{2\sqrt{3}}{-2}$$

$$=-\sqrt{3}$$

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8. Use limits to determine the slope of the tangent to y = 5 - 3x^2 at x = 1

$$m_T=\lim_{h\to 0}\frac{f(1+h)-f(1)}{h}$$

$$=\lim_{h\to 0}\frac{5-3(1+h)^2-2}{h}$$

$$=\lim_{h\to 0}\frac{5-3(1+2h+h^2)-2}{h}$$

$$=\lim_{h\to 0}\frac{-6h-3h^2}{h}$$

$$=\lim_{h\to 0}-6-3h$$

$$=-6$$

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9. Determine the slope of the tangent to $y = \frac{2}{x}$ at x = 2.

$m_T = -\frac{1}{2}$

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34, 55, 89 . . .

APPS-Using Limits

1. Consider the sequence 1, 1, 2, 3, 5, 8, 13, 21,….. Let t_n represent the n^{th} term.

a) Determine t_1, t_9 and t_{15}.

b) Determine $\lim_{n \to \infty} \frac{t_{n+1}}{t_n}$ (2 decimal)

$t_1 = 1$

$t_9 = 34$

$t_{15} = 610$

$R_1 = 1$

$R_2 = 2$

$R_3 = 1.5$

$R_4 \doteq 1.67$

$R_5 = 1.6$

$R_6 = \frac{13}{8}$ ($\doteq 1.625$)

≈ 1.62

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1. An object is launched from a launch pad on the surface of Neptune. Its height, in m, is given in terms of the time, (t in sec), by $H(t) = 93.5 + 88t - 5.5t^2$.
Use **limits** (when necessary), to answer the following.

a) What is the height of the launch pad? $t=0$
b) What is the initial velocity of the object?
c) What is the velocity of the rocket at 8s? What does this imply? $t = 10_s$
d) What is the maximum height of the rocket?
e) When does the object land on the surface of Neptune?
f) What is the average velocity of the entire flight?

M_T = AT $t=0$

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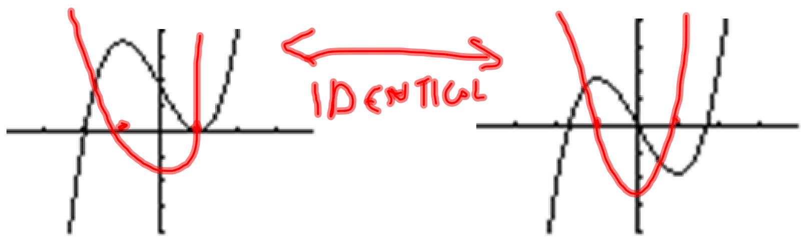
COMM-Sketching and Discussing Rates of Change

Two graphs are provided below. For each graph, sketch the rate of change graph. Compare the two rate of change graphs. Explain the significance.



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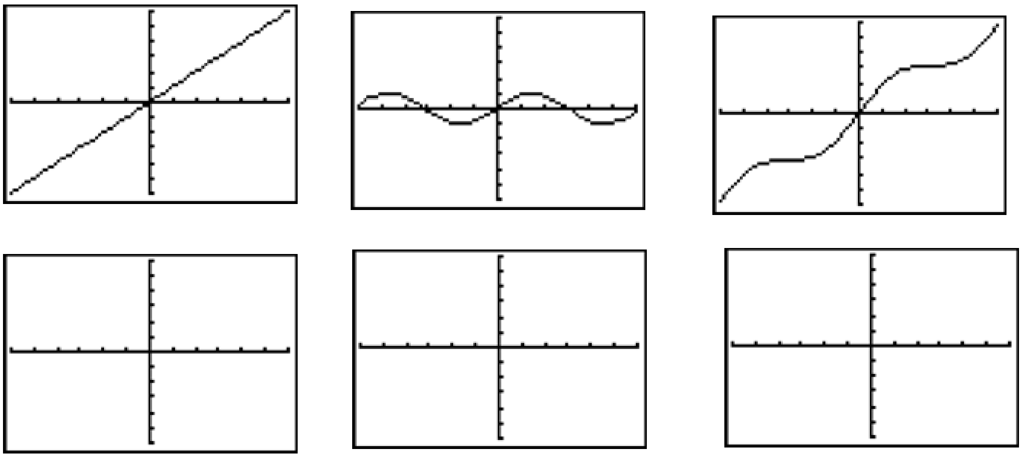
TIPS

Below is are the graphs of $y = x$, $y = \sin(x)$, and $y = \sin(x) + x$.

a) **Sketch** the rate of change graphs for $y = \sin(x)$ and $y = x$.

b) **Explain** how these rate of change graphs could be used to predict the rate of change graph for the $y = \sin(x) + x$.

c) **Sketch** the rate of change graph for $y = \sin(x) + x$.



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1.

A parabloid is the solid that is produced by rotating a parabola about its axis of symmetry. Each horizontal cross section is a circle, but each vertical cross section is a parabola. A cup in the shape of the parabloid, (generated from the parabola $y = 2x^2$) is being filled with a constant flow of water of 9π cm^3/sec. ($V = 0.5\pi r^2 h$)

a) Give the equation for the water's height in terms of the time. It starts empty.

b) What is the average rate of change of the height over the first ten seconds?

c) How fast is the height increasing at 9 seconds?

$y=2x^2 \rightarrow h = 2r^2$

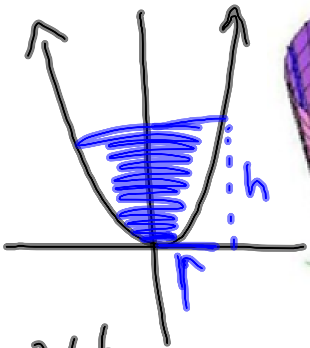
$r^2 = \frac{h}{2}$

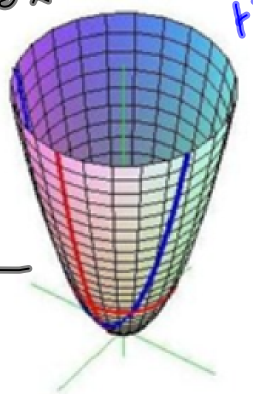
a) $V = 9\pi t$

$V = 0.5\pi r^2 h$

$9\pi t = \frac{\pi}{2} r^2 h$

$9\pi t = \frac{\pi}{2}\left(\frac{h}{2}\right)h$





$h^2 = 36t$

$\boxed{h = 6t^{\frac{1}{2}}}$

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