MCV 4U – Grade 12 Calculus & Vectors, University Preparation

1. [4] The height of a golf ball in h metres after t seconds is given by $h(t) = -4.9t^2 + 30.2t$

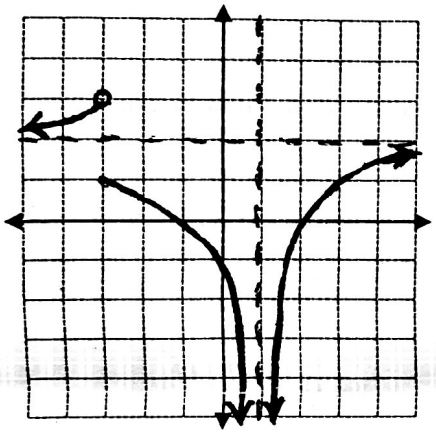
a) Determine the average rate of change from t = 0s to 3s.

b) Determine the instantaneous rate of change when t = 5s.

2. [10] Given the graph below find

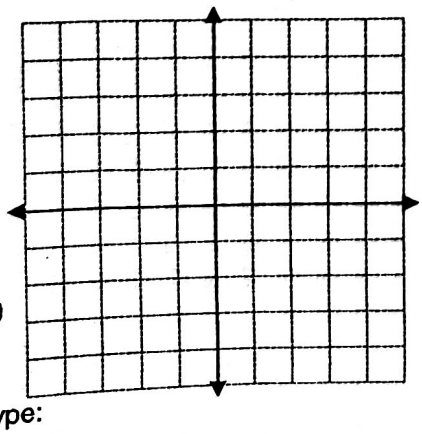
a) $\lim_{x\to -3^+} f(x)$ b) $\lim_{x\to -3^-} f(x)$ c) $\lim_{x\to -3} f(x)$ d) $\lim_{x\to 1^+} f(x)$ e) $\lim_{x\to 1^-} f(x)$

f) $\lim_{x\to 1} f(x)$ g) $\lim_{x\to \infty} f(x)$ h) $\lim_{x\to -\infty} f(x)$ i) f(-3) j) f(1)



3. [10] Graph each function and state the type of discontinuity.

a) $f(x) = \begin{cases} \frac{1}{2}x^2 + 3, x < -2 \\ 4 - x, x \geq -2 \end{cases}$ b) $f(x) = 5 - x^2, x \neq 3$ c) $f(x) = \frac{1}{x-2}$



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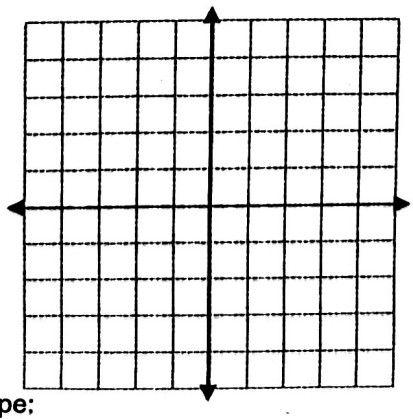

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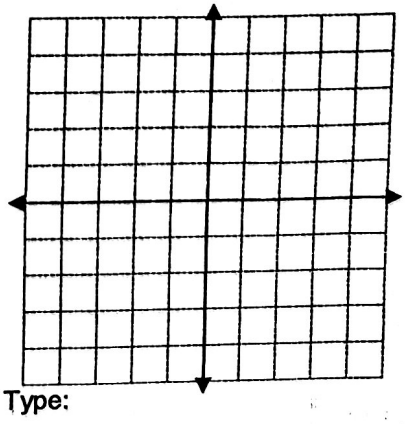

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4. [7] Evaluate each limit.

$$\lim_{x\to 3}\frac{x^2-9}{2x^2-5x-3}$$

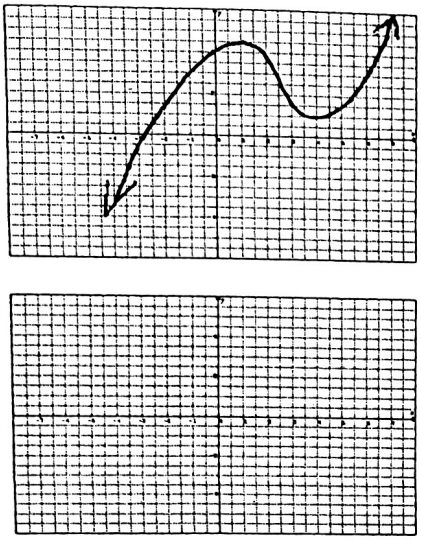
b) $$\lim_{x\to -2}\frac{\frac{4}{x-3}+\frac{4}{5}}{x+2}$$

c) $$\lim_{x\to 0}\frac{\sqrt{7x+5}-\sqrt{5}}{x}$$

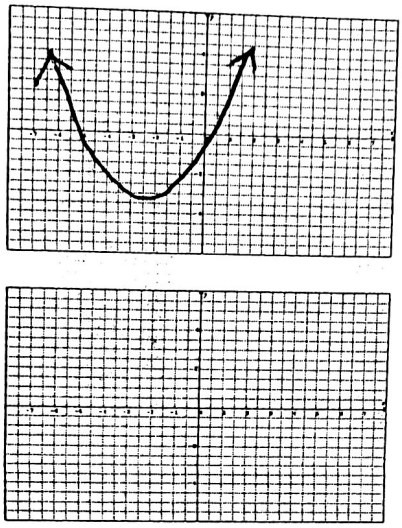
5. [3] Find the derivative of $f(x)=-3x^2+7x-1$ using first principles.

6. [6] Graph the derivative of the given function.

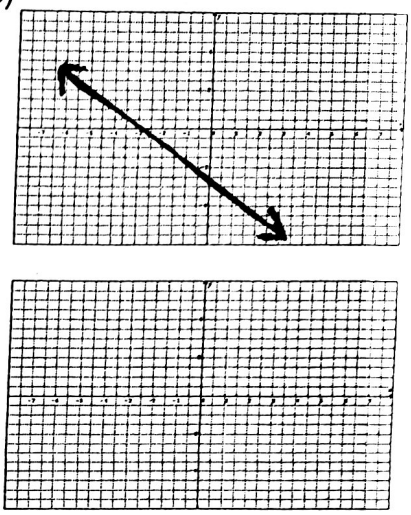
a)



b)



c)

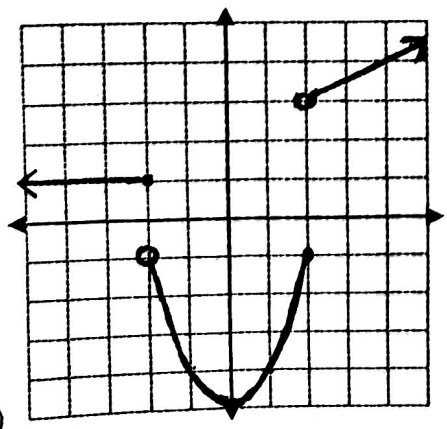


7. [4] Find and explain your solution.

a) $\lim_{x \to -3} \frac{|x+3|}{x+3}$

b) $\lim_{x \to 2} \sqrt{x-2}$

8. [6] Find the equation of the graph.



9. [5] Find each limit.

a) $\lim_{x \to 64} \frac{\sqrt[3]{x} - 4}{x - 64}$

b) $\lim_{x \to \infty} \frac{2x^2 + 1}{x^2 + 7x}$

10. [7] Find the values of m and b if $f(x) = \begin{cases} mx^2 + bx + 40, x < 3 \\ mx + b, x \geq 3 \end{cases}$ is differentiable.

11. [4] Sketch a graph f(x) so that $\lim_{x\to -4^-} f(x) = -1$, $\lim_{x\to -4^+} f(x) = 2$, $\lim_{x\to 0^-} f(x) = -\infty$, $\lim_{x\to 0^+} f(x) = \infty$, $\lim_{x\to \infty} f(x) = 3$, $\lim_{x\to -\infty} f(x) = 3$, $f(-4) = 2$ and $f(-1) = 1$.