



1. For the function defined by: Determine the following limits:

$$f(x) = \left\{ \begin{array}{ll} \frac{3}{x+5} & x < -1 \\ 3\left(\frac{x+2}{3-x}\right) & -1 < x < 0 \\ \frac{x^2 - 2x + 1}{x-1} & x > 0 \end{array} \right\}$$

A) $\lim_{x \rightarrow -1} f(x)$

B) $\lim_{x \rightarrow 0} f(x)$

2. Find the limit if it exists.

A) $\lim_{x \rightarrow 7} \frac{\sqrt{x+2} - 3}{x-7}$

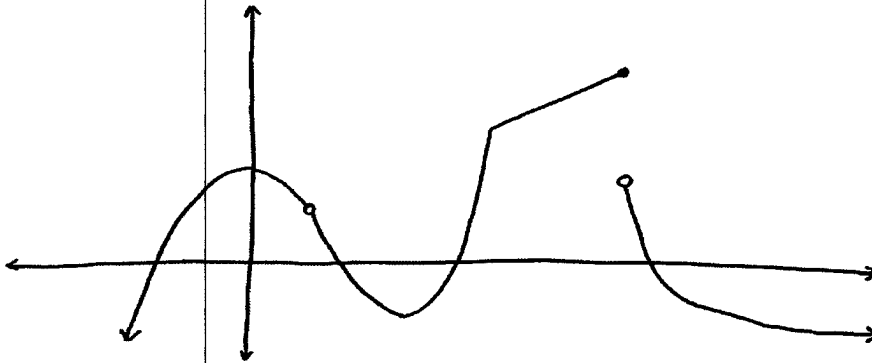
B) $\lim_{t \rightarrow 0} \left(\frac{1}{t} - \frac{1}{t^2 + t} \right)$

C) $\lim_{x \rightarrow -1} \frac{x^2 - 4x}{x^2 - 3x - 4}$

D) $\lim_{x \rightarrow 2^-} \frac{|x-2|}{x-2}$

3. A) State the three classifications of discontinuities, and
B) Sketch an example of each classification

4. Draw the graph of f' , given the following graph of f



5. Let

$$f(x) = \begin{cases} 4x - 3 & x > 1 \\ 2x^2 - 1 & x \leq 1 \end{cases}$$

A) Is f continuous at $x = 1$?

B) Is f differentiable at $x = 1$?

6. Find all x -values where the tangent line to $f(x) = \frac{1}{3}x^3 - x^2 - 13x + 7\pi$ has a slope of 2.

7. Find the first derivative (dy/dx):

A) $y = \frac{3}{(2x^2 + 5x)^{3/2}}$

B) $y = \sec^2(5x)$

C) $y = \sqrt{\frac{1-x}{1+x^2}}$

D) $y = \ln(3x^2 + 4x)$

E) $y = 2x - \frac{1}{2}e^{2x}$

F) $\sin(y^2) = y \cos(x)$

8. Find equation of tangent line to curve at the point (1,2)

$$x^2 + 2xy - y^2 + x = 2$$

9. If a snowball melts so that its surface area decreases at a rate of $1 \text{ cm}^2/\text{min}$, find the rate at which the diameter decreases when the diameter is 24 cm.

10. A particle is moving along the curve $y = \sqrt{x}$. As the particle passes through the point (4,2), its x -coordinate increases at a rate of 3 cm/sec. How fast is the distance from the particle to the origin changing at this instant?