1. For the function defined by:

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

Determine the following limits:

A) \( \lim_{x \to -1} f(x) \)

B) \( \lim_{x \to 0} f(x) \)

2. Find the limit if it exists.

A) \( \lim_{x \to 2} \frac{\sqrt{x + 2} - 3}{x - 7} \)

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

C) \( \lim_{x \to 1} \frac{x^2 - 4x}{x^2 - 3x - 4} \)

D) \( \lim_{x \to 2} \frac{|x - 2|}{x - 2} \)

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 \( \left( \frac{dy}{dx} \right) \):
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 cm\(^2\)/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?