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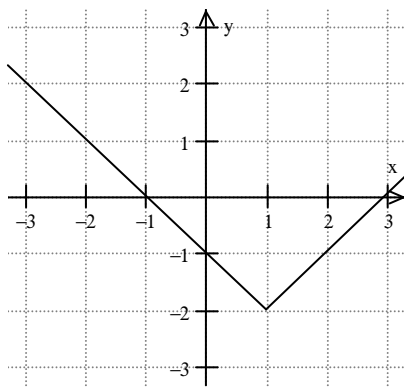
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The Sharp EL-531 calculator may be used on this test.
 You may not use L'Hôpital's Rule when evaluating limits.
 Show all of your work in the space provided.
 The number of marks for each question is indicated in brackets.

1. Evaluate $f(-4)$ given $f(x) = \begin{cases} 5 + 7x, & x \leq -4 \\ 3 - 2x, & x > -4 \end{cases}$.

[1]

2. Given the graph of the function $y = f(x)$ below, (a) sketch the graph of $y = -f(x)$ in the same xy -plane and (b) state the domain of the derivative of $y = f(x)$.

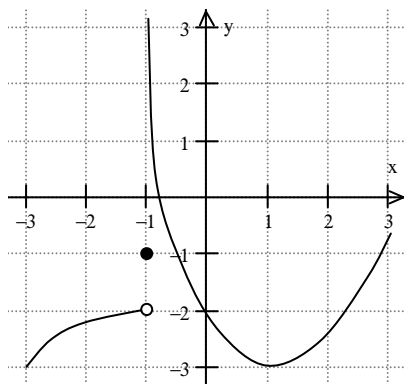


[2]

(a) see graph

(b) The domain of $f'(x)$ is _____.

3. Given the graph of the function $f(x)$ below, find $\lim_{x \rightarrow -1^-} f(x)$, or if it does not exist, then determine whether it is ∞ or $-\infty$ or neither.



[1]

$\lim_{x \rightarrow -1^-} f(x) =$ _____

4. Find the equation of the tangent line to the curve $y = 2x^3 - 5x + 6$ at $x = -3$. Express your answer in the slope-intercept form $y = mx + b$.

[3]

5. Evaluate the limits. If they do not exist, then determine whether they are ∞ or $-\infty$ or neither.

(a) $\lim_{x \rightarrow -2} \frac{x^2 - 4}{3x^2 + 5x - 2}$

[2]

(b) $\lim_{x \rightarrow 3} \left[\frac{3}{x-3} - \frac{x}{x-3} \right]$

[1]

(c) $\lim_{\theta \rightarrow 0} 2\theta \cot \theta$

[1]

6. Use the **limit definition** of the derivative to find $f'(x)$, where $f(x) = -6 + \sqrt{4x-9}$.

[4]

7. Use derivative rules to calculate the derivatives of the following functions.

(a) $y = \sqrt[3]{t} - \frac{6}{\sqrt{t}}$

[2]

(b) $g(\theta) = 4\theta^3 \sec^2 \theta$

[2]

(c) $h(x) = \frac{3x^4}{(x^3 + 7)^2}$ (Express your answer in factored form.)

[3]

8. State the product rule of differentiation and then prove it.

$$\frac{d}{dx}[f(x)g(x)] = \underline{\hspace{4cm}}$$

[3]