

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.

Mark:

25

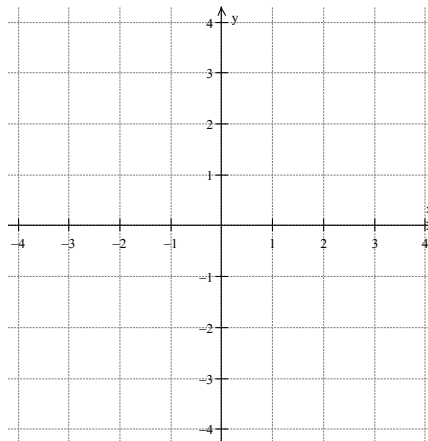
1. Determine whether the function $f(x) = x \sin x$ is even, odd or neither.

[1]

2. Evaluate the one-sided limit $\lim_{x \rightarrow 7^+} f(x)$, given $f(x) = \begin{cases} 5 - 6x, & x \leq 7 \\ 2 + 10x, & x > 7 \end{cases}$.

[1]

3. Sketch the graph of a function that is continuous at all $x \neq 2$ and that satisfies the following:
 $f(2) = 3$, $\lim_{x \rightarrow 2^-} f(x) = 1$ and $\lim_{x \rightarrow 2^+} f(x) = -2$.



[1]

4. Suppose $1 - x^2 \leq f(x) \leq \cos x$ for all x . Use the Squeeze Theorem to find $\lim_{x \rightarrow 0} f(x)$.

[1]

5. What is the value of the following limit? You do not need to show any work.

[1]

$$\lim_{\Delta x \rightarrow 0} \frac{\sec(x + \Delta x) - \sec x}{\Delta x} = \underline{\hspace{2cm}}$$

6. Evaluate the limits and show your work. If they do not exist, then answer ∞ or $-\infty$ if applicable.

(a) $\lim_{x \rightarrow \pi} \frac{\sin x}{x}$

[1]

(b) $\lim_{x \rightarrow 2} \frac{2x^2 - 8}{x - 2}$

[1]

(c) $\lim_{x \rightarrow 6} \frac{\frac{5}{2x+3} - \frac{1}{3}}{x-6}$

[3]

7. Let $f(x) = 5 - 3\sqrt{x+4}$. Use the **limit definition** of the derivative to find $f'(x)$.

[3]

8. Use derivative rules to calculate the derivatives of the following functions. Simplify your answers.

(a) $f(x) = \frac{x^2 - 2}{11x^2 + 3}$

[2]

(b) $y = 4 \sin^5(8x^3 - 7)$

[2]

(c) $h(t) = t \cdot \sqrt[3]{1-t}$

[3]

9. The position of an object in meters after t seconds is given by $s(t) = 8t + \frac{9}{t} + 2$, for $t > 1$. Calculate the instantaneous velocity (in m/s) at $t = 3$ seconds.

[2]

10. Prove $\frac{d}{dx}\cos x = -\sin x$.

[3]