1. Find the limit
A) \( \lim_{x\to\infty} \arcsin\left(\frac{x}{1+2x}\right) \) B) \( \lim_{x\to\infty} \frac{2-x}{\sqrt{7+6x^2}} \)
C) \( \lim_{x\to+\infty} \ln(3x + 1) - \ln(2x^2 + 1) \)
D) \( \lim_{x\to\infty} \cos\left(\frac{1}{x^2}\right) \) E) \( \lim_{x\to0} \cos\left(\frac{1}{x^2}\right) \).

2. Find a value for the constant \( k \) that makes
\[
f(x) = \begin{cases} 
\sin 3x & x \neq 0, \\
k & x = 0,
\end{cases}
\]
continuous at \( x = 0 \).

3. Consider the function \( f(x) = \frac{x^2+3x+2}{x^2+4x+3} \).
A) There are two values of \( x \) at which \( f(x) \) is not defined. What are these values? Call them \( r \) and \( s \).
B) Is it possible to define \( f(x) \) at \( r \) so that \( f \) is continuous at \( r \)? If so, what should the value \( f(r) \) be? If not, explain why not.
C) Is it possible to define \( f(x) \) at \( s \) so that \( f \) is continuous at \( s \)? If so, what should the value \( f(s) \) be? If not, explain why not.

4. Let \( f(x) = 4x^2 + x \).
A) Find the average rate of change of \( f \) with respect to \( x \) over the interval \([1, 4]\).
B) Find the instantaneous rate of change of \( f \) with respect to \( x \) at \( x = 4 \) (directly from definition).
C) Find an equation of the tangent line to the curve \( y = f(x) \) at \( x = 4 \).

5. Let \( f(x) = |x| \). Sketch the graph of
A) \( y = f(x) \)
B) \( y = f'(x) \), the derivative of \( f \)
C) \( y = f''(x) \), the derivative of \( f' \).