

# Calculus Final Exam Study Guide

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1. (No Calc) What is the value of  $\lim_{x \rightarrow -1} \frac{x^2 - 3x - 4}{x^2 - 1}$ ?

*Start by plugging in:*

$$= \frac{(-1)^2 - 3(-1) - 4}{(-1)^2 - 1} = \frac{1 + 3 - 4}{1 - 1} = \frac{0}{0}$$

*We have the indeterminate form, we need to use L'Hopital's Rule. Take the derivative of the top and bottom (separately), then try plugging in again.*

$$= \lim_{x \rightarrow -1} \frac{2x - 3}{2x} = \frac{2(-1) - 3}{2(-1)} = \frac{-2 - 3}{-2} = \frac{-5}{-2} = \frac{5}{2}$$

2. (No Calc) What is the equation of the line tangent to  $f(x) = 3x - 5 \cos 2x$  at  $x = 0$ ?

*We will use the form:  $y = m(x - x_1) + y_1$ . We have our  $x_1$ , we only need  $m$  and  $y_1$ .*

*To get  $y_1$ , plug into the original equation:*

$$f(0) = 3(0) - 5 \cos(2 \cdot 0) = 0 - 5 \cos 0 = -5$$

*To get  $m$ , plug into the derivative (remember to use the chain rule!):*

$$\begin{aligned} f'(x) &= 3 + 10 \sin 2x \\ f'(0) &= 3 + 10 \sin(2 \cdot 0) \\ &= 3 \end{aligned}$$

*And now we just plug into the equation of the line:*

$$y = 3(x - 0) - 5$$

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**A. A. Frempong**



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Hospital's rule improper integrals and memory devices to help the student memorize the basic differentiation and integration formulas as well as trigonometric identities This book is one of the most user friendly calculus textbooks ever published

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