

AP CALCULUS AB
Unit 3
Exam – Sample

Name _____
Date _____
Period _____

No calculators may be used on this test.

1. Find each limit. Show all work that leads to your final answers.

a. $\lim_{x \rightarrow 0} \frac{x^2}{xe^x - x}$

b. $\lim_{x \rightarrow \infty} \frac{\ln x}{\sqrt{x}}$

c. $\lim_{x \rightarrow 1^+} \left(\frac{1}{\ln x} - \frac{1}{x-1} \right)$

d. $\lim_{x \rightarrow 0^+} (\cos x)^{\frac{1}{x^2}}$

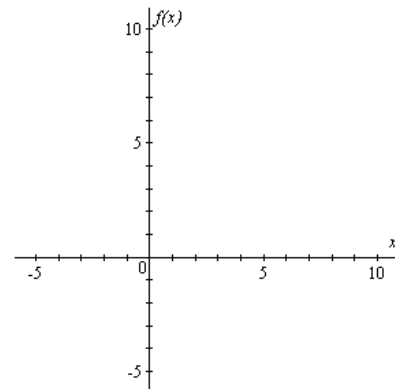
2. Consider the function f defined below with the following derivatives.

$$f(x) = \frac{2x^2 - 8}{(x-4)^2} \qquad f'(x) = \frac{-16(x-1)}{(x-4)^3} \qquad f''(x) = \frac{16(2x+1)}{(x-4)^4}$$

a. Identify intervals of increase/decrease and concavity in f .

b. Identify all relative extreme values and points of inflection in f .

c. Sketch f in the window provided. Label all asymptotes and intercepts.



3. Let $f(x) = x^{\frac{2}{3}} - 1$

a. Does the Mean Value Theorem apply on the interval $[0, 8]$? Justify your answer. If so, find the value(s) of c that satisfies the Mean Value Theorem over the interval.

b. Does the Mean Value Theorem apply on the interval $[-1, 8]$? Justify your answer. If so, find the value(s) of c that satisfies the Mean Value Theorem over the interval.

4. Use the Second Derivative Test to find the value(s) of x corresponding to all relative extreme values for $f(x) = x^3 + 3x^2 - 9x$. Justify your answer(s).

5. Use the graph at the right to complete the table.

Condition	Domain Interval/Value
$f'(x) < 0$	
$f'(x) = 0$	
$f'(x) > 0$	
$f''(x) < 0$	
$f''(x) = 0$	
$f''(x) > 0$	

