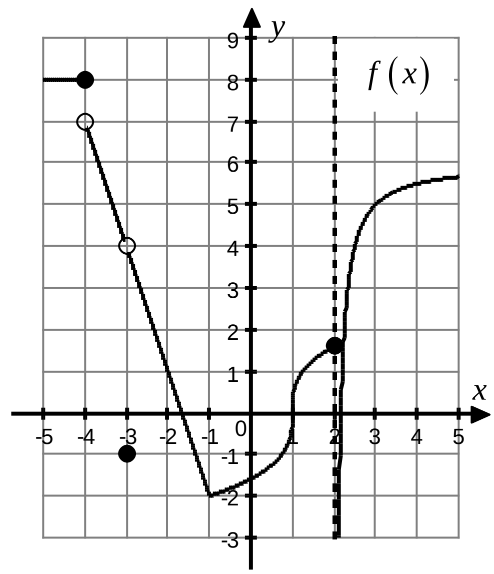
AP CALCULUS AB
Unit 1
Exam – Sample

Name ____________________
Date ____________________
Period ____________________

No calculators may be used on this portion of the exam.

1. Use the graph of f to evaluate or approximate (whichever is appropriate) each expression.



a. $\lim\limits_{x\to -3} f(x)$

b. $\lim\limits_{x\to 2^+} f(x)$

c. $\lim\limits_{x\to -1} f(x)$

d. $f'(-4.5)$

e. $f'(-2)$

f. $f'(-1)$

g. $f'(0)$

h. $f'(1)$

i. $\lim\limits_{x\to 3}\left(x^2 f(x)\right)$

j. $\lim\limits_{x\to 1}\left(f(x)-2x\right)$

2. Use the *limit definition of the derivative* to find $g'(x)$ for the function $g(x) = 2 - \frac{1}{x}$.

3. a. Write a piecewise-defined function for $h(x) = \frac{25 - x^2}{|5 - x|}$.

b. Find $\lim_{x \to 5^-} h(x)$.

4. Find each limit.

a. $\lim_{\theta \to \pi} \cos\left(\frac{1}{\theta - \pi}\right)$

b. $\lim_{u \to 6} \frac{u - \sqrt{5u+6}}{u-6}$

c. $\lim_{x \to 1} \tan^{-1}\left(\frac{3x-2}{x^2}\right)$

d. $\lim_{z \to \infty}\left(z^5 - 2z^4\right)$

e. $\lim_{x \to -\infty} \frac{3x^4 - 3x^2 + 1}{x-1}$

f. $\lim_{x \to 9^-} \frac{x^2 - 1}{9 - x}$

g. $\lim_{u \to \infty} \frac{1-u}{\sqrt{3u^2 - u}}$

h. $\lim_{n \to \infty} \frac{3n^2 - 2}{n^2 - n^4}$

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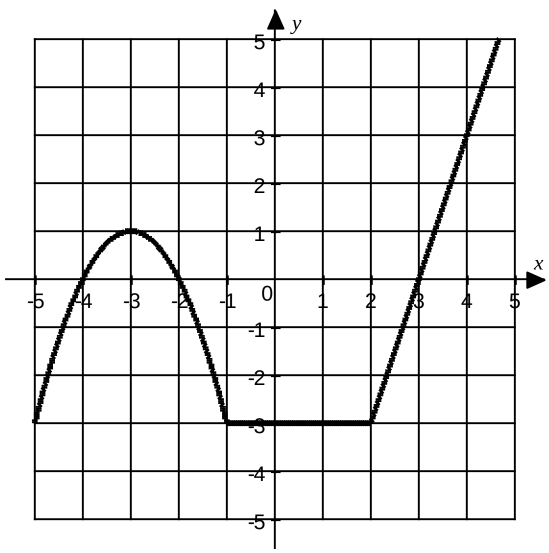
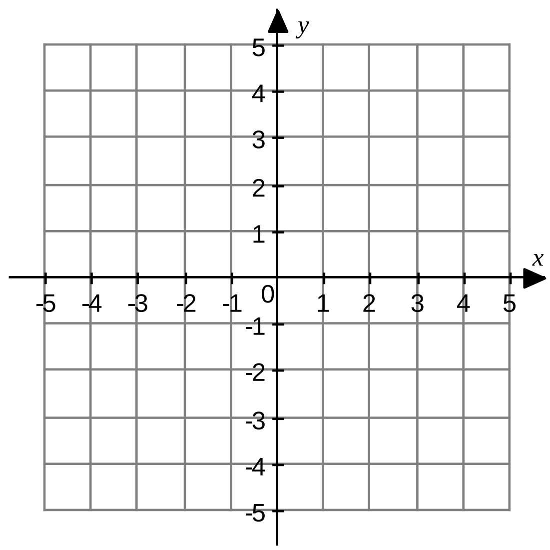
5. Using the graph of f given below, sketch a graph of f' on the axes provided.

$f(x)$



$f'(x)$



6. Suppose the function *h*, represented in the table below, is continuous for all real numbers.

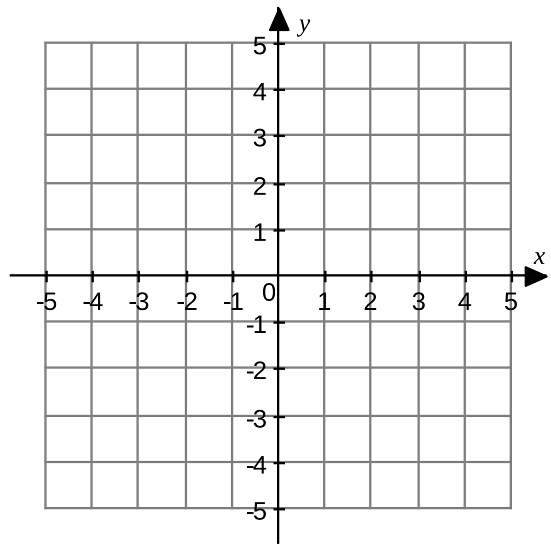
x	-2	-1	0	1	2	3
$h(x)$	4	-1	-3	-1	2	3

a. Approximate $h'(-0.5)$.

b. Suppose $g(x) = (h(x))^2 - 1$. Show that there must be a value *c* for $1 < c < 3$ such that $g(c) = 2$.

7. Let $g(x)=\begin{cases} 2x+5, & -5\le x<-1 \\ 4-x^2, & -1<x<2 \\ \dfrac{2}{x}, & 2\le x\le 5 \end{cases}$.

a. Sketch the graph of g using the axes given to the right.



b. Identify the value(s) of x such that g has a discontinuity. Classify each as either a *removable*, *jump*, or *infinite* discontinuity.

c. Re-define g so that it is continuous at each removable discontinuity.

8. Find the values of a and b that make $f\left(x\right)=\begin{cases} e^x+1, & x<0 \\ \cos x-2a, & 0\le x<\pi \\ b+6a, & x\ge \pi \end{cases}$ a continuous function.