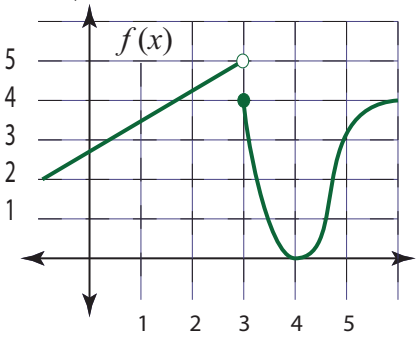
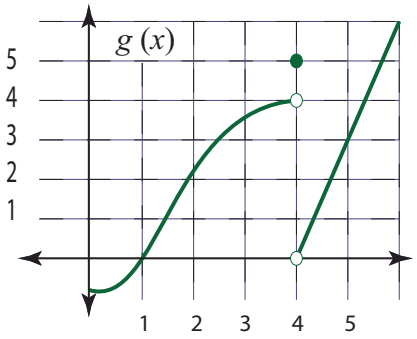
Calculus I. Test 1 Review.
Make sure you also study all the quizzes, then notes and homework examples!

1. Use the graphs shown for f and g to evaluate each function value or limit (or answer DNE).





a) $f(3) = ?$

b) $g(4) = ?$

c) $\lim_{x \to 3^+} f(x) = ?$

d) $\lim_{x \to 3} f(x) = ?$

e) $\lim_{x \to 4^-} [f(x) + g(x)] = ?$

f) $\lim_{x \to 3} \dfrac{f(x)}{g(x)} = ?$

g) $\lim_{x \to 1} \dfrac{g(x)}{f(x)} = ?$

2. Given: $\text{f(x)} = \begin{cases} \frac{(7-x)}{3x^2-21x} & \text{for} \quad x < 7 \\ 7x & \text{for} \quad 7 \leq x \end{cases}$

a) $f(7) = ?$

b) $\lim_{x \to 7^+} f(x) = ?$

c) $\lim_{x \to 7^-} f(x) = ?$

d) $\lim_{x \to 7} f(x) = ?$

e) Is $f(x)$ continuous at $x = 7$? If not, what kind of discontinuity is it ? _____

3. Find the following limits.

   a) $\lim_{x\to 3} \dfrac{x^2+3x-1}{5-x} = ?$

   b) $\lim_{x\to 1} \dfrac{4x^2+3x-7}{2x-2} = ?$

4. Find the following limits.

   a) $\lim_{x\to\infty} \left(\dfrac{3x}{1-x} + e^{-\left(\frac{x^2+3x}{2x}\right)} \right)$

   b) $\lim_{x\to 0} \tan^{-1}\left(\dfrac{2x^3+4x}{10x^2+100x+57} \right)$

   c) $\lim_{x\to 4} \tan^{-1}\left(\dfrac{-1}{(x-4)^2} \right)$

   d) $\lim_{x\to\infty} \tan^{-1}\left(e^{\left(\frac{-1}{(x-4)^2}\right)} \right)$

5. If $f(x) = 5x + x^3$ then write the limit that will define $f'(x)$. (Just set it up, don't find the limit.)

6. If $f(x) = 5 + x^{\sin(2x)}$ then write the limit that will define $f'(x)$. (Just set it up, don't find the limit.)

7. Find $\lim_{h\to 0} \dfrac{(4(x+h)-3)-(4x-3)}{h}$.

8. If $f'(5) = 7$ and $f(5) = 23$ then what is the equation of the tangent line to $f(x)$ at $x = 5$?

9. If $g(x) = \frac{x^3}{3} - x^2 + x$ and $g'(x) = x^2 - 2x + 1$, then find the equation of the tangent line to $g(x)$ at $x = -2$.

10. Short derivatives. These are just for quick review; they may be seen as part of a test question. Find y' for each.

Power Rule:

$y = x^2$

$y = 7x^{-3}$

$y = 2x + 1 - \dfrac{3}{x^2}$

$y = \sqrt[5]{x^7}$

$y = x^{\sqrt{3}}$

Exponential:

$y = e^x$

$y = 3^x$

$y = (\ln 2)^x$

Trig:

$y = \sin x$

$y = \cos x$

$y = \tan x$

$y = \cot x$

$y = \sec x$

$y = \csc x$

11. Find y'. Don't simplify.

a) $y = \dfrac{x^4 - \sqrt{x}}{\sin x}$

b) $y = \dfrac{1}{\sqrt[7]{x^5}}$

c) $y = x^e e^x$

d) $y = e^x \sin x$

e) $y = 7x^2 e^x$

f) $y = 2^x \tan x$

g) $\dfrac{x+1}{1-\sin x}$

h) $\dfrac{x+2^x}{1-x^3 e^x}$

i) $y = 7x \cot x$

j) $y = \dfrac{\sec x}{x-1}$