The tests are cummulative and can include Pre-Calculus material mentioned in the MATH 2301 Calculus I handbook. This guide gives some sample questions for Sections 1.6, 2.1, 2.2, 2.3, and 2.4. In some cases part of the problem is deciding which method to use, so you may be able to do the problem using methods from earlier sections. Doing these problems does not replace doing homework problems.

1. Compute the following limits. If you use the squeeze theorem, then indicate the two functions that you are using to squeeze.

   (a) $\displaystyle\lim_{x\to 2^+} \frac{x+2}{x^2-5x+6}$

   (b) $\displaystyle\lim_{x\to -\infty} \frac{3x^3-4}{2x^3-2}$

   (c) $\displaystyle\lim_{x\to\infty} \cos(1/x)$

   (d) $\displaystyle\lim_{x\to\infty} (x-x^2)$

   (e) $\displaystyle\lim_{x\to\infty} \sin(\pi/x)$

   (f) $\displaystyle\lim_{x\to -\infty} \frac{3x^3-4}{1+20x^3-2x} =$

   (g) $\displaystyle\lim_{x\to\infty} (x-\sin(x))$

2. Let $f(x) = -x^2+3$.

   (a) State the definition of the derivative as a limit.

   (b) Using this definition, compute $f'(x)$.

   (c) Find the equation for the tangent line at $x = 2$.

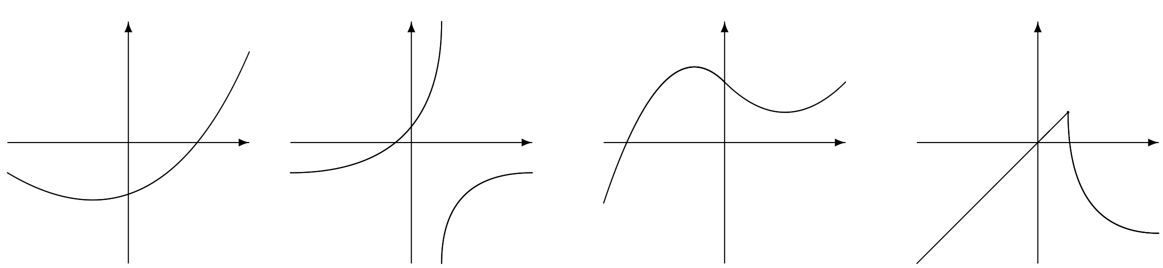
   (d) Graph $f(x)$ and the tangent line.

3. Find the limit. What derivative does this limit represent?

$$\lim_{h\to 0} \frac{(x+h)^3 - x^3}{h}$$

4. Find values for m and b so that $f(x) = \begin{cases} x^2 & \text{if } x \le -2 \\ mx+b & \text{if } x > -2 \end{cases}$ is differentiable at $x = -2$.

5. The graph of a function f is given in each part below. On the same axes, sketch the graph of f'.



6. Sketch the graph of a function g for which $g(0) = g'(0) = 0$, $g'(-1) = -1$, $g'(1) = 3$, and $g'(2) = 1$.

7. Compute the following derivatives:

   (a) $f(x) = 2 + x + \frac{3}{x} - \sqrt{x} - 5x^7 + x^{3/4} \Rightarrow f'(x) =$

   (b) $\frac{d}{dx}\left[3\sin(x) + \cot(x) - \sin(7)\right] =$

   (c) $D_x\left[(x^9 + x^8 + x^5 + 3)(1 + 2x^2 + 9x^3 - 4x^4)\right] =$

   (d) $y = \frac{x^3 + x}{x} \Rightarrow \frac{dy}{dx} =$

   (e) $D_x\left[(9\cos(x) + x^8 + x^5 + 3)\sin(x)\right] =$

   (f) $y = \frac{x^3 + 5x}{\sin(x)} \Rightarrow \frac{dy}{dx} =$

   (g) $D_x\left[\frac{\sin(x)\cos(x)}{x^3 + x}\right] =$

8. State

   - the definition of "Continuous" and
   - the definition of "Differentiable".

   Give an example of a function that is one but not the other.