Math 266A A02 **Winter 2009** **Guide for Test 3**

The third test is in class on Friday 20 February, and covers sections 4.1–4.6.

Here are some sample questions, so that you have an idea of what to expect. The homework problems are also a good source of practice material.

1. Let $f(x) = x^2 - 3$.
   (a) Using the definition of the derivative as a limit, compute $f'(x)$.
   (b) Find the equation for the tangent line at $x = 2$.
   (c) Graph $f(x)$ and the tangent line.

2. Compute the following derivatives:
   (a) $f(x) = \sin(x) \Rightarrow f'(x) =$
   (b) $f(x) = \sin(3) \Rightarrow f'(x) =$
   (c) $f(x) = \cos(x) \Rightarrow f'(x) =$
   (d) $f(x) = \tan(x) \Rightarrow f'(x) =$
   (e) $f(x) = e^x \Rightarrow f'(x) =$
   (f) $f(x) = 3^x \Rightarrow f'(x) =$
   (g) $f(x) = x^3 \Rightarrow f'(x) =$
   (h) $f(x) = 2 + x + \dfrac{3}{x} - \sqrt{x} - 5x^7 + x^{3/4} \Rightarrow f'(x) =$
   (i) $y = \dfrac{x^3 + x}{x} \Rightarrow \dfrac{dy}{dx} =$
   (j) $D_x\left[(x^9 + x^8 + x^5 + 3)(1 + 2x^2 + 9x^3 - 4x^4)\right] =$
   (k) $\dfrac{d}{dx}\left[(x^9 + 2x^{1/3} + x^5 + 3)^4\right] =$
   (l) $\dfrac{d}{dx}\left[5\tan(x^2\sin(3^x + 7x))\right] =$
   (m) $D_x\left[\left((x^9 + x^8 + x^5 + 3)(1 + 2x^2 + x^3 - 4x^4) + 1\right)^9\right] =$

3. 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 $x = -2$.

4. The radius of a spherical cell is observed to decrease at a rate of 2 units/second when that radius is 30 units long. How fast is the volume of the cell decreasing at that point?