MAT 137
Tutorial #5– Computation of derivatives
October 31–November 1, 2016

1. Compute the derivative of the following functions:

   (a) $f(x) = \dfrac{x^2+2}{x^2-2}$

   (b) $f(x) = x^3 \tan(2x+1)$

   (c) $f(x) = \sqrt{\dfrac{x+1}{x-1}}$

   (d) $f(x) = \sin^2 x + \sin x^2 + \sin(2x) + \sin^2 x^2$

   (e) $f(x) = \dfrac{1+x\sin x}{x+\cos x}$

   (f) $f(x) = \sqrt{x+\sqrt{x+\sqrt{x}}}$

   Check your answers:

   (a) $f'(2) = -4$

   (b) $f'(1) = 3\tan 3 + 2\sec^2 3$

   (c) $f'(2) = \dfrac{-1}{\sqrt{3}}$, $f'(-2) = \dfrac{-1}{3\sqrt{3}}$, $f'(0)$ undefined.

   (d) $f'(2) = \sin 4 + 6\cos 4 + 4\sin 8$

   (e) $f'\left(\dfrac{\pi}{2}\right) = \dfrac{2}{\pi}$

   (f) $f'(1) = \dfrac{3+4\sqrt{2}}{8\sqrt{2}\sqrt{1+\sqrt{2}}}$

2. Find a polynomial which has positive derivative when $1 < x < 2$, and negative derivative when $x < 1$ or $2 < x$.

3. Find a function which has a vertical tangent line at $x = 1$, positive derivative when $x < 1$, and negative derivative when $x > 1$.

4. Find a polynomial that has the same tangent line at the points with x-coordinate 0 and the point with x-coordinate 2, but a different tangent line at the point with x-coordinate 1.

   Note: "The same tangent line" does not mean merely the same derivative; it means more than that.