MAT 137
Tutorial #6– Computation of derivatives
October 29-30, 2018

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) $f(x) = e^x \ln(\ln x)$

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

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

   (g) $f(x) = \sqrt{x + \sqrt{x + \sqrt{x+1}}}$

   (h) $f(x) = e^{x^e}$

   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) $f'(e^2) = e^{e^2}\left(\ln 2 + \dfrac{1}{2e^2}\right)$

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

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

   (g) $f'(0) = 7/8$

   (h) $f'(1) = e^2$

Further practice

It is okay if you only have time for Question 1. Only attempt the next questions if you have entirely completed Question 1.

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

3. Let N be a positive integer. Let $g(x) = x\sin(x^N)$. Find the smallest positive integer k such that $g^{(k)}(0) \neq 0$. What is $g^{(k)}(0)$ for that value of k?