**123 Problem Sheet Hillary 2**[1]
24 January 2001

**1.** $f(x) = \log(1 + x^2 + 3x^3)$. Using the chain rule work out $f'(x)$. Using the quotient rule work out $f''(1)$

**2.** Differenciate $\ln \tan x$ with respect to $x$.

**3.** Use the chain rule and product rule to differenciate $y = xe^{-x^2}$ and find the extrema.

**4.** Find the extrema of $y = 2x^3 + 3x^2 - 12x + 9$ and say weather they are maxima or minima.

**5.** Using l'Hôpidal's rule work out

$$\lim_{x \to 0} \frac{e^{2x} - e^{-2x}}{x}$$

**6.** Calculate the Taylor expansion of $\cot x$ around $x = \pi/2$ up to $O(h^3)$.

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