

St. Andrew's and St. Bride's High School
Advanced Higher Homework 3

1. Differentiate with respect to x (simplifying the answers fully):

(a) $\exp(4x^3 + 1)$ i.e. $e^{4x^3 + 1}$

(b) $\ln(5x^2 + 2)$

(c) $\ln|\operatorname{cosec} x|$

(d) $\exp(\sin x)$

(e) $e^x \cos x$

2. If $y = e^{3x}$, find: (a) $\frac{d^2y}{dx^2}$ (b) $\frac{d^3y}{dx^3}$ (c) $\frac{d^ny}{dx^n}$

3. Differentiate with respect to x (leaving each answer as a single algebraic fraction):

(a) $y = \ln|(3x + 2)^5 (2x - 1)^4|$

(b) $y = \ln\left|\frac{(4x + 3)^{1/2}}{(2 - x)^3}\right|$

4. Differentiate the following functions from First Principles:

(a) $f(x) = 4x^2 + x + 3$

(b) $f(x) = x^4$

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