

Find the derivative with respect to  $x$  of the following functions. **Additionally, find the derivative with respect to  $a$  of function  $h$ .**

Provide your answers on this sheet. Where you took more than one step to arrive at the final result, please include the important steps. You may fill out the sheet by hand and submit a scanned version.

$$f = 3x^2$$

$$g = (x + 8)^2$$

$$h = ax^3 + \frac{1}{2}x^8$$

$$k = x^{501} + 3x^7 - \frac{1}{2}x^6 + x^5 + 2x^3 + 3x^2 - 1$$

$$\frac{df}{dx} = 3 \times 2x = 6x$$

$$\frac{dg}{dx} = 2(x+8)$$

$$\frac{\partial h}{\partial x} = 3x^2a + \frac{8x^7}{2} = 3x^2a + 4x^7$$

$$\frac{\partial h}{\partial a} = x^3 + 0 = x^3$$

$$\frac{dk}{dx} = 501x^{500} + 21x^6 - 3x^5 + 5x^4 + 6x^2 + 6x$$

Note the  $\partial$  used in the derivative for the function  $h$ .  $\frac{\partial h}{\partial x}$  and  $\frac{\partial h}{\partial a}$  indicate these are the **partial derivative** to  $x$  and  $a$  respectively.