

# Math Camp Exercises - Day 4

**Instructor:** Henry Watson

**Assistant:** Ankushi Mitra

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1. Calculate the area under the curve:

(a)  $\int_0^2 (2 + x) dx$

(b)  $\int_{-1}^1 (3x^3 - x^2 + x - 1) dx$

(c)  $\int_1^e \left(\frac{1}{x}\right) dx$

2. For each of the following, find the partial derivative with respect to both  $x$  and  $z$ :

(a)  $f(x, z) = 2z^2 + x^2$

(b)  $f(x, z) = z^3 - 2$

(c)  $f(x, z) = xz^2$

(d)  $f(x, z) = x^3z^2 - x$

3. Find the gradient and the Hessian of the following function:

$$f(x, y, z) = 2xy + 4x^2z^3 - 3y^3z + \ln(10)$$