

## Week 2: Integration Basics + Revision

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### Q1 - Indefinite Integration Practice

Compute the following indefinite integrals:

$$\begin{array}{lll} (a) \int (2x^4 + 3x^2 + x + 8) dx & (b) \int \left( \sqrt{x} + \frac{1}{\sqrt{x}} \right) dx & (c) \int \sqrt{8+9x} dx \\ (d) \int x^3(1-12x^4)^{1/8} dx & (e) \int 7x^4 e^{x^5} dx & (f) \int \frac{x}{\sqrt{8-2x^2}} dx \\ (g) \int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx & (h) \int e^{7x} dx & (i) \int \frac{3x+2}{x+5} dx \\ (j) \int x dx & (k) \int \ln x dx & (l) \int x \ln x dx \end{array}$$

### Q2 - Trigonometric Integrals

$$\begin{array}{lll} (a) \int \sin(5x) dx & (b) \int \sin x \cos x dx & (c) \int \cos^2 x \sin x dx \\ (d) \int \cos x dx & (e) \int \sec^2 \frac{x}{5} dx & (f) \int \tan x \sec^2 x dx \\ (g) \int \frac{\sin^3 x}{\sec^9 x \tan x} dx \end{array}$$

### Q3 - Differentiation and Derivatives

Find the derivative using first principles for:

$$f(x) = \frac{x}{x+1}$$

Find a function whose derivative is  $\sin(x^3)$  and whose value at:

$$x = 0 \text{ is } 0, 2$$

$$x = 1 \text{ is } -1$$

### Additional - Numerical Integration & Properties of Integrals

Use the trapezoid rule to estimate:

$$\int_1^5 \frac{e^x}{x} dx$$

$x$	1	2	3	4	5
$\frac{e^x}{x}$	2.7	3.7	6.7	13.6	29.7

Verify:

$$\int (f + g) dx = \int f dx + \int g dx$$

For  $f(x) = x^2$  and  $g(x) = x$ .