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## Jupiter

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### Question - Integration

First differentiate each of the following functions:

◇  $x^2 + 3x + 2$

◇  $x^2 + 3x$

◇  $\frac{1}{3}x^3 + \frac{3}{2}x^2$

Using your answers above, can you give the integral of  $f(x) = 2x + 3$ ? i.e.

$$\int 2x + 3 \, dx = ?$$

### Question - Integration areas under curves

Write the integral notation for what integral you would need to calculate to find the area under the curve  $f(x) = x^2 + 1$  between  $x = 1$  and  $x = 4$ .

(You can do the calculation if you wish)

### Question - Definite integration

Given that the indefinite integral of  $\cos(2x) + 4x$  is  $\frac{1}{2} \sin(2x) + 2x^2 + C$ , calculate

$$\int_0^{\pi} \cos(2x) + 4x \, dx$$

## Question - Checking your answer

Use [www.desmos.com/calculator](http://www.desmos.com/calculator) or some other graphical calculator to sketch the function from the previous question ( $\cos(2x) + 4x$ ). Was the answer to the previous question positive or negative? Can you see why from the graph?

## Question - Integration

Find the indefinite integral of the following function:

$$f(x) = \frac{1}{x^2} + \frac{1}{x} + 1 + x$$

## Question - Integration

Given that the derivative of  $\sin(4x + 3)$  is  $4 \cos(4x + 3)$  and that the derivative of  $\cos(4x + 3)$  is  $-4 \sin(4x + 3)$  you use one of these facts to find the following integral.

$$\int 24 \cos(4x + 3) \, dx$$