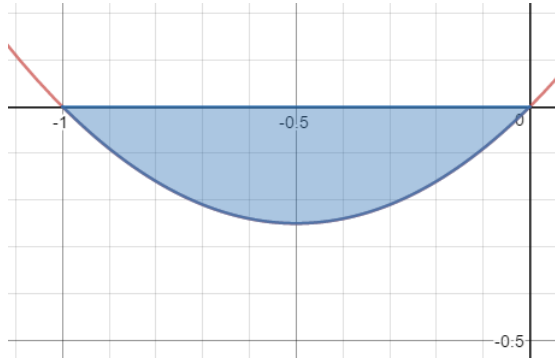


Integral Calculus lesson 5 - Area below the x axis

Magic Monk Tutorials

1 Evaluate the following:

1.1 The shaded area of the curve (i.e. between $x=-1$ and 0) $y = x^2 + x$

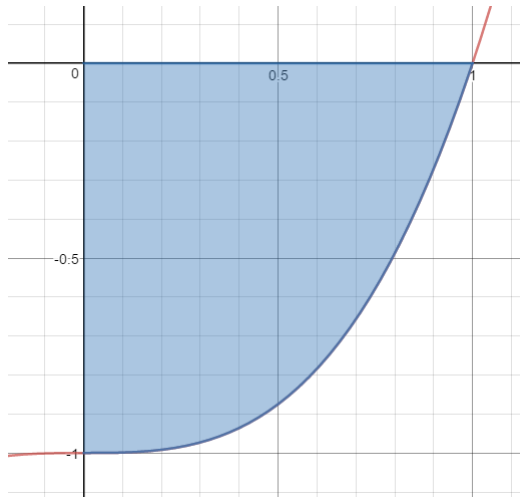


Write the question in integral form, where the bounds are $x = -1$ to 0 and the function is $y = x^2 + x$.

$$\int_{-1}^0 x^2 + x \, dx = \left[\frac{x^3}{3} + \frac{x^2}{2} \right]_{-1}^0 = \left[\frac{0^3}{3} + \frac{0^2}{2} \right] - \left[\frac{(-1)^3}{3} + \frac{(-1)^2}{2} \right] = - \left(\frac{1}{2} - \frac{1}{3} \right) = -\frac{1}{6}$$

We are after the shaded area, and since area can't be negative, take the positive value of the integral. Area is $\frac{1}{6}$.

1.2 The shaded area of the curve (between $x=0$ and 1) $y = x^3 - 1$

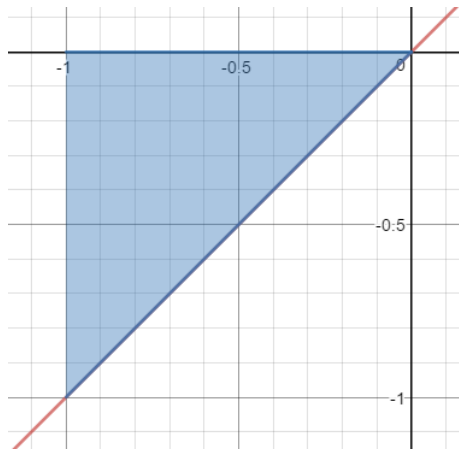


Write the question in integral form, where the bounds are $x = 0$ to 1 and the function is $y = x^3 - 1$.

$$\int_0^1 x^3 - 1 \, dx = \left[\frac{x^4}{4} - x \right]_0^1 = \left[\frac{1^4}{4} - 1 \right] - \left[\frac{0^4}{4} - 0 \right] = -\frac{3}{4}$$

We are after the shaded area so take the positive value of the integral. Area is $\frac{3}{4}$.

1.3 The shaded area of the curve $y = x$



Write the question in integral form, where the bounds are $x = -1$ to 0 and the function is $y = x$.

$$\int_{-1}^0 x \, dx = \left[\frac{x^2}{2} \right]_{-1}^0 = \left[\frac{0^2}{2} \right] - \left[\frac{(-1)^2}{2} \right] = -\frac{1}{2}$$

We are after the shaded area so take the positive value of the integral. Area is $\frac{1}{2}$.