DEFINITE INTEGRAL

Ex Find the area under the graph of $f(x) = \frac{1}{x^3}$

between $x=1$ and $x=3$

$$A = \boxed{\int_1^3 \frac{1}{x^3}\,dx} \underset{\text{SET UP}}{=} \frac{x^{-3+1}}{-3+1}\Bigg|_1^3 = \frac{x^{-2}}{-2}\Bigg|_1^3$$

$\boxed{N=-3}$ ANTIDERIVATIVE

$$\frac{1}{x^3} = x^{-3}$$

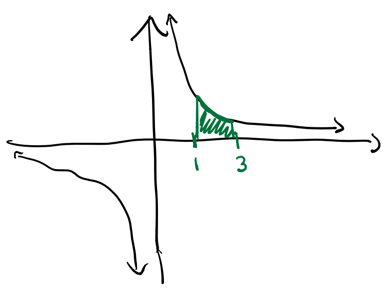
$$\int x^N = \frac{x^{N+1}}{N+1} + C$$

$N=-3$ power rule

$$= -\frac{1}{2x^2}\Bigg|_1^3 = \left(-\frac{1}{2(9)}\right) - \left(-\frac{1}{2}\right)$$

evaluate at 3 − evaluate at 1

$$= -\frac{1}{18} + \frac{1}{2} = -\frac{1}{18} + \frac{9}{18} = \frac{8}{18} = 4/9$$



plug in

Ex (ww)

$$\int_4^7 \frac{10x^2+6}{\sqrt{x}}\,dx =$$

break up $\frac{10x^2+6}{\sqrt{x}} = \frac{10x^2}{\sqrt{x}} + \frac{6}{\sqrt{x}} = 10x^{3/2} + 6x^{-1/2}$

write each term as a power function

Algebra $\frac{x^2}{\sqrt{x}} = x^N \qquad \frac{x^2}{x^{1/2}} = x^{2-\frac{1}{2}} = x^{3/2}$

$$\frac{1}{\sqrt{x}} = \frac{1}{x^{1/2}} = x^{-1/2}$$

$$\int_4^7 \frac{10x^2+6}{\sqrt{x}}\,dx = \int_4^7 10x^{3/2} + 6x^{-1/2}\,dx =$$

$\downarrow$ algebra step

$N = 3/2$ $\quad$ $N = -1/2$

$$10\,\frac{x^{3/2+1}}{3/2+1} + 6\,\frac{x^{-1/2+1}}{-1/2+1}\Bigg|_4^7 =$$

$$10\,\frac{x^{5/2}}{\frac{5}{2}} + 6\,\frac{x^{1/2}}{\frac{1}{2}}\Bigg|_4^7 = 4x^{5/2} + 12\sqrt{x}\,\Bigg|_{4\ a}^{7\ b}$$

$$\frac{10}{1} * \frac{2}{5} = \frac{20}{5} = 4$$

$$\frac{6}{1} * \frac{2}{1} = 12$$

$$= \left(4\,(7)^{5/2} + 12\sqrt{7}\right) - \left(4\,(4)^{5/2} + \overbrace{12\sqrt{4}}^{24}\right) = 398.316272\ldots$$

evaluate at 7 $\qquad$ evaluate at 4

$F(b)$ $-$ $F(a)$ $\qquad$ F antiderivative