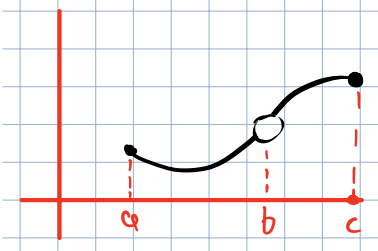
Integral - Impropia

Byte Planet

$$\int_{-1}^{3} \frac{1}{x^3}\,dx$$

* $x = 0$ discontinua

3) Cuando f no es continua en algún punto intermedio del extremo de integración.



$$\rightarrow \int_a^c f(x)\,dx = \lim_{\varepsilon \to 0} \int_a^{b-\varepsilon} f(x)\,dx + \lim_{\varepsilon \to 0} \int_{b+\varepsilon}^{c} f(x)\,dx$$

$$\int_{-1}^{3} \frac{1}{x^3}\,dx = \int_{-1}^{3} x^{-3}\,dx$$

$$= \lim_{\varepsilon \to 0} \int_{-1}^{0-\varepsilon} x^{-3}\,dx + \lim_{\varepsilon \to 0} \int_{0+\varepsilon}^{3} x^{-3}\,dx$$

$$= \lim_{\varepsilon \to 0} \int_{-1}^{-\varepsilon} x^{-3}\,dx + \lim_{\varepsilon \to 0} \int_{\varepsilon}^{3} x^{-3}\,dx$$

* $\int u^n\,du = \frac{u^{n+1}}{n+1} + C$

$$= \lim_{\varepsilon \to 0} \left[\frac{x^{-2}}{-2} \right]\Big|_{-1}^{-\varepsilon} + \lim_{\varepsilon \to 0} \left[\frac{x^{-2}}{-2} \right]\Big|_{\varepsilon}^{3}$$

$$= -\frac{1}{2} \lim_{\varepsilon \to 0} \left[x^{-2} \right]\Big|_{-1}^{-\varepsilon} - \frac{1}{2} \lim_{\varepsilon \to 0} \left[x^{-2} \right]\Big|_{\varepsilon}^{3}$$

$$= -\frac{1}{2} \lim_{\varepsilon \to 0} \left[(-\varepsilon)^{-2} - (-1)^{-2} \right] - \frac{1}{2} \lim_{\varepsilon \to 0} \left[3^{-2} - \varepsilon^{-2} \right]$$

$$= -\frac{1}{2} \lim_{\varepsilon \to 0} \left[\frac{1}{\varepsilon^2} - \frac{1}{1} \right] - \frac{1}{2} \lim_{\varepsilon \to 0} \left[\frac{1}{9} - \frac{1}{\varepsilon^2} \right]$$

$$= -\frac{1}{2}\left[\frac{1}{0} - 1\right] - \frac{1}{2}\left[\frac{1}{9} - \frac{1}{0}\right]$$

$$= -\frac{1}{2}\left[\infty - 1\right] - \frac{1}{2}\left[\frac{1}{9} - \infty\right]$$

$$= -\infty + \frac{1}{2} - \frac{1}{18} + \infty$$

$$= \infty \quad \therefore \text{ Es divergente}$$

Grafica