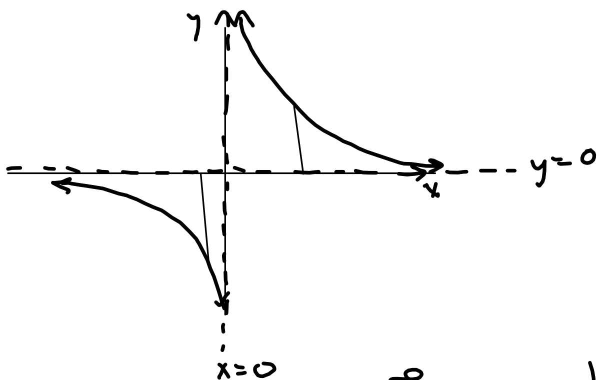
$$\int_{-1}^{3} x^{-5}\,dx = \left[\frac{1}{-4}x^{-4}\right]_{-1}^{3} = -\frac{1}{4}\left[3^{-4} - (-1)^{4}\right]$$

$$= -\frac{1}{4}\left[\frac{1}{81} - \frac{1}{1}\cdot\frac{81}{81}\right] = -\frac{1}{4}\left[\frac{-80}{81}\right] = \frac{20}{81}$$

x^{-5} is not cnt^{s} on $[-1,3]$

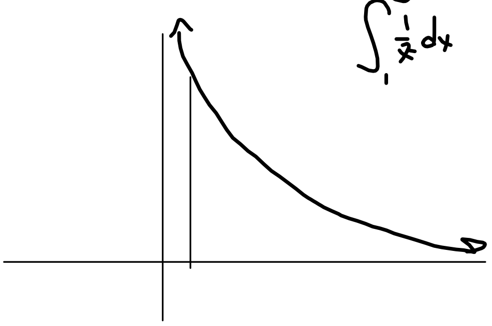
$0^{-5} \nexists$

$\frac{1}{x}, \frac{1}{x^3}, \frac{1}{x^5}, \ldots$



$\int_{1}^{\infty} \frac{1}{x}\,dx$ Exists!

$\int_{0}^{1} -\sqrt[3]{x}\,dx$ Exists!



$f(x) = \begin{cases} x^2+1 & \text{if } x<0 \\ 3x & \text{if } x\geq 0 \end{cases}$ Suture point: $x=0$

$$\int_{-1}^{4} f(x)\,dx = \int_{-1}^{0} f(x)\,dx + \int_{0}^{4} f(x)\,dx$$

$$= \int_{-1}^{0} (x^2+1)\,dx + \int_{0}^{4} 3x\,dx$$

$$\left[\frac{x^3}{3}+x\right]_{-1}^{0} + \left[\frac{3}{2}x^2\right]_{0}^{4}$$

$$= 0+0-\left(\frac{(-1)^3}{3}+(-1)\right)$$

$$= -\left(-\frac{1}{3}-1\right) = \boxed{\frac{4}{3}}$$

Let $g(x) = \int_{-x^2}^{\sin(x)} \frac{\cos^2(t)}{1+t^2}\,dt = \int_{-x^2}^{0} * \quad + \int_{0}^{\sin(x)} *$

$= -\int_{0}^{-x^2} \frac{\cos^2(t)}{t^2+1}\,dt + \int_{0}^{\sin(x)} \frac{\cos^2(t)}{t^2+1}\,dt$

$\Longrightarrow g'(x) = -\left(\frac{\cos^2(x^2)}{(x^2)^2+1}\right)(2x) + \left(\frac{\cos^2(\sin(x))}{\sin^2(x)+1}\right)(\cos(x))$