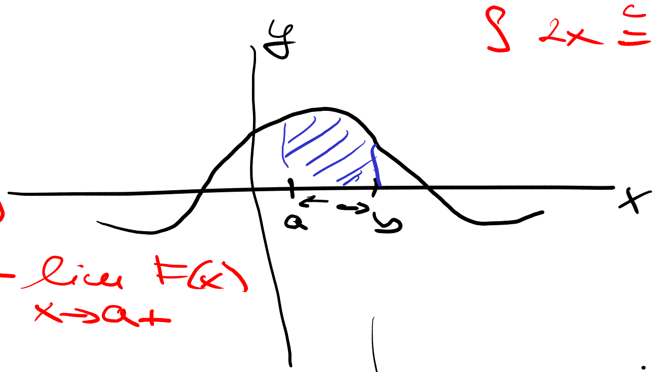
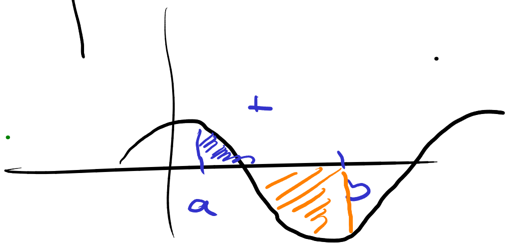
Definite $\int$ $\qquad \int f = F \qquad \int 2x \overset{c}{=} x^2$

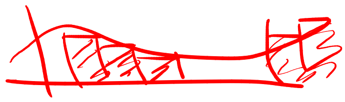


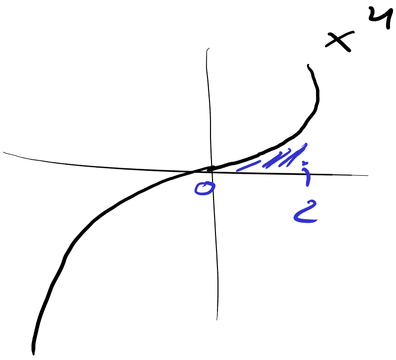
$$\int_a^b f(x)\,dx = F(b) - F(a) = \lim_{x\to b-} F(x) - \lim_{x\to a+} F(x)$$

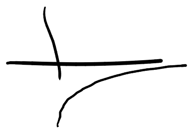
$$\int_0^2 x^3\,dx = \left[\frac{x^4}{4}\right]_0^2 = \frac{2^4}{4} - \frac{0^4}{4} = \frac{16}{4} = 4$$



Riemann $\int$





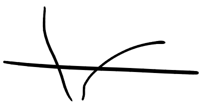


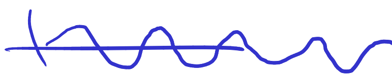
$$\int_1^\infty \frac{1}{x^2} = \left[-\frac{1}{x}\right]_1^\infty = \lim_{x\to\infty-} -\frac{1}{x} - \lim_{x\to 1+} -\frac{1}{x} =$$

$$= 0 - \frac{-1}{1} = 1$$

$$\int_1^\infty \frac{1}{x} = \left[\ln|x|\right]_1^\infty = \lim_{x\to\infty-} \ln|x| - \lim_{x\to 1+} \ln|x| =$$

$$= \infty - 0 = \underline{\underline{\infty}}$$:)





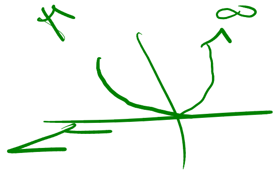
$$\int_{\pi/2}^\infty \cos x\,dx = \left[\sin x\right]_{\pi/2}^\infty = \lim_{x\to\infty} \sin x - \lim_{x\to\frac{\pi}{2}+} \sin x$$

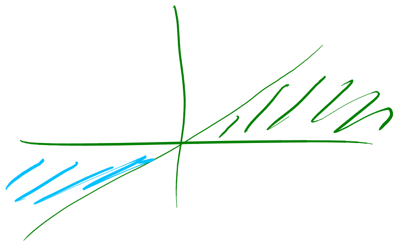
$$= \nexists - 1 \qquad \nexists$$:(

$$\int_{-\infty}^{\infty} x \, dx = \left[\frac{x^2}{2}\right]_{-\infty}^{\infty} = \lim_{x \to \infty_-} \frac{x^2}{2} - \lim_{x \to -\infty_+} \frac{x^2}{2} =$$

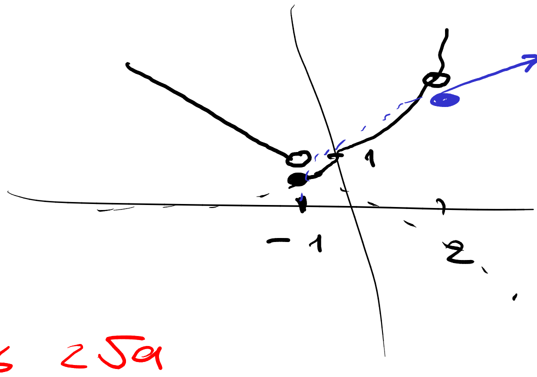
$$= \infty - \infty \quad \text{not well defined}$$

$$\to \int_{-\infty}^{\infty} x \;\nexists \quad :($$



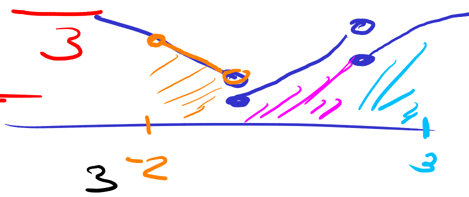


$$f(x) = \begin{cases} -x & x < -1 \\ e^x & -1 \leq x < 2 \\ \sqrt{x+1} & x \geq 2 \end{cases}$$



no F :(

$$\int_{-2}^{3} f(x)\,dx = \frac{3}{2} + e^2 - e^{-1} + \frac{16}{3} - \frac{2\sqrt{a}}{3}$$



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

$$+\int_{-1}^{2} e^x = \left[e^x\right]_{-1}^{2} = e^2 - e^{-1}$$

$$+\int_{2}^{3} \underbrace{\sqrt{x+1}}_{(x+1)^{1/2}} = \left[\frac{2}{3}(x+1)^{3/2}\right]_{2}^{3} = \frac{2}{3}\left(\underbrace{4^{3/2}}_{(\sqrt{4})^3} - \underbrace{3^{3/2}}_{\sqrt{(3^3)}}\right)$$

$$= \frac{2}{3}\left(8 - \sqrt{a}\right)$$

$$|x| \xrightarrow{\text{1st Step}} f(x) = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$$

Per partes

$$\int_0^1 x e^x \, dx = \left[x e^x\right]_0^1 - \int_0^1 1 \cdot e^x \, dx$$

$u = x \qquad v' = e^x$

$u' = 1 \qquad v = e^x$

$$= \left[x e^x\right]_0^1 - \left[e^x\right]_0^1 =$$

$$= 1 e^1 - 0 \cdot e^0 - (e^1 - e^0) =$$

$$= e - e + 1 = \underline{\underline{1}}$$

Substitution

$$\int_0^\infty \frac{1}{1+x^2} \cdot \arctan x \, dx = \int_0^{\pi/2} y \, dy = \left[\frac{y^2}{2}\right]_0^{\pi/2}$$

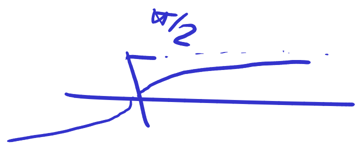
$y = \arctan x$

$dy = \frac{1}{1+x^2} dx$

$$= \frac{\frac{\pi^2}{4}}{2} - 0 = \frac{\pi^2}{8}$$

$\arctan x = y$

x	0	∞
y	0	$\pi/2$



$$= \int y \, dy = \frac{y^2}{2} = \frac{\arctan^2 x}{2}$$

$$\int_0^\infty \frac{\arctan x}{1+x^2} dx = \left[\frac{\arctan^2 x}{2}\right]_0^\infty = \frac{\left(\frac{\pi}{2}\right)^2}{2} - 0 = \frac{\pi^2}{8}$$