$x(x^2+3x)$ $\qquad x(2x+3) + 1(x^2+3x)$

x^3+3x^2 $\qquad 2x^2+3x + x^2+3x$

$3x^2+6x$

$(2s-1)(s+4)$ $\qquad (2s-1)1 + 2(s+4)$

$2s^2+7s-4$

$4s+7$

$$\frac{f(x)}{g(x)} \Rightarrow \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$$

$$\frac{\sin(x)}{3x^2} \qquad \frac{3x^2\cos(x) - 6x\sin(x)}{9x^{4}} \qquad \frac{x\cos(x) - 2\sin(x)}{3x^3}$$

$$\cot(x) = \frac{\cos(x)}{\sin(x)} \qquad \frac{\sin(-\sin(x)) - \cos(x)(\cos(x))}{\sin^2(x)}$$

$$\frac{-\sin^2(x) - \cos^2(x)}{\sin^2(x)} \qquad \frac{-1(1)}{\sin^2(x)} \qquad -\frac{1}{\sin^2(x)}$$

$$= -\csc^2(x)$$

$$\csc = \frac{1}{\sin(x)} = \frac{0\sin(x) - \cos(x)}{\sin^2(x)} \qquad \frac{-\cos(x)}{\sin^2(x)} \qquad \frac{-\cot(x)}{\sin(x)}$$

Chain Rule

$\sin^2(x)$ $\quad f = x^2$

$g = \sin(x)$

$f(g(x))$

$f'(g(x)) \cdot g'(x)$ $\quad 2(\sin(x)) \cdot \cos(x)$

$\sin(x^2)$

$f(x) = \sin(x)$

$g(x) = x^2$

$\cos(x^2) \cdot 2x$

g $\quad f$

$3x+1$ $\quad x^3 - 5x$

$(3x+1)^3 - 5(3x+1)$

$27x^3 + 27x^2 + 9x + 1$

$-(15x+5)$

$(3(3x+1)^2 - 5) \cdot 3$

$81x^2 + 54x + 9 - 15$

$(3(9x^2+6x+1) - 5)\,3$

$81x^2 + 54x - 6$

$27x^2 + 18x - 2$

$\frac{dy}{dx}$

$f(g(x))$ $\quad f(u)$

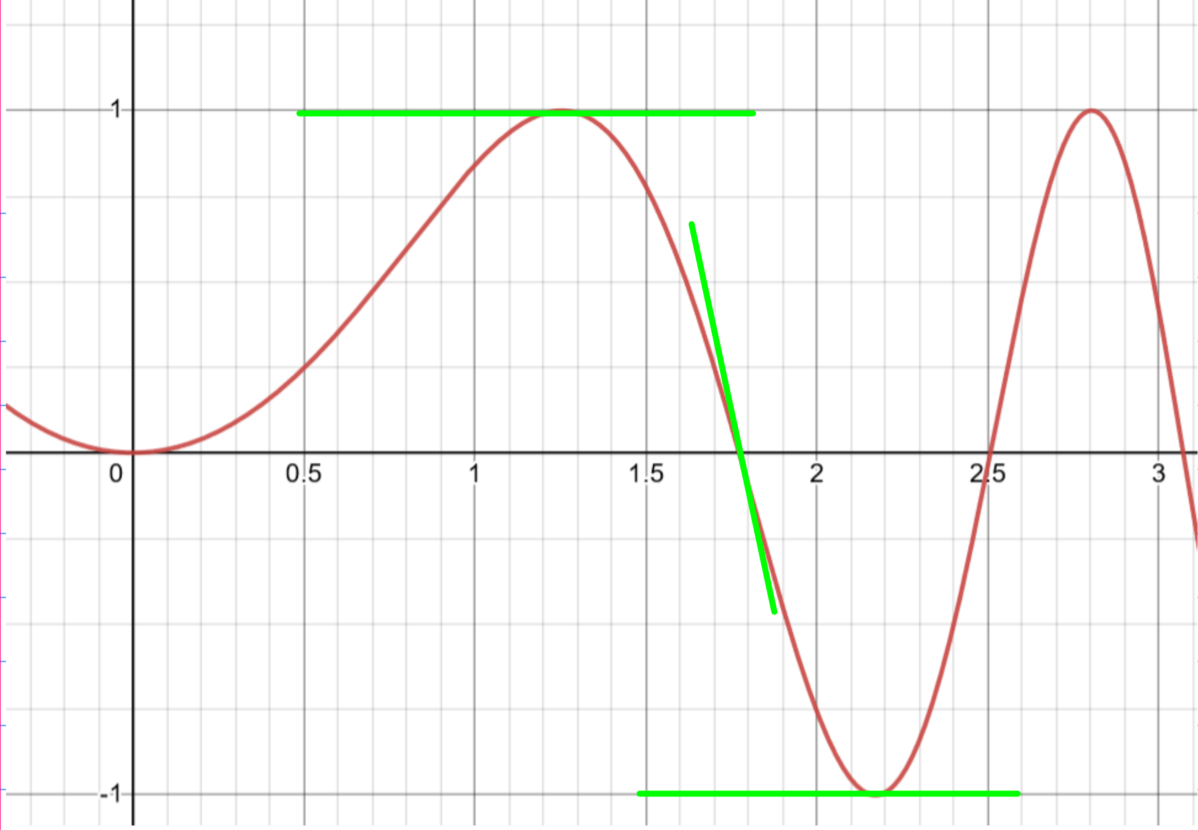
$\sin(x^2)$

$\uparrow$

u

$\frac{dy}{du} \cdot \frac{du}{dx}$

$\sin(u)$

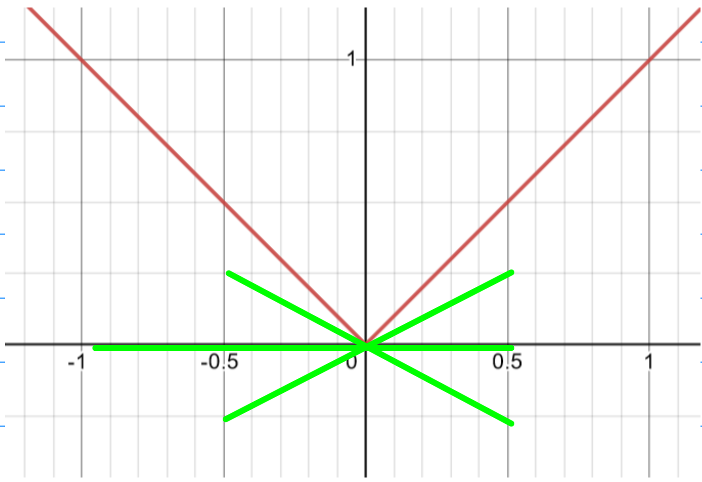


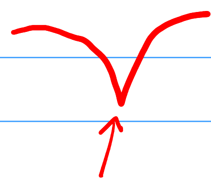
Slope : $\cos(\pi) \cdot 2\sqrt{\pi}$

$-2\sqrt{\pi}$

$\sin(\pi) = 0$

$(y-0) = -2\sqrt{\pi}(x-\sqrt{\pi})$

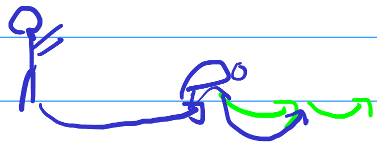




$f'(x)$	$f(x)$
$2x$	x^2+5
	x^2+C
x^4	$\frac{x^5}{5}+C$

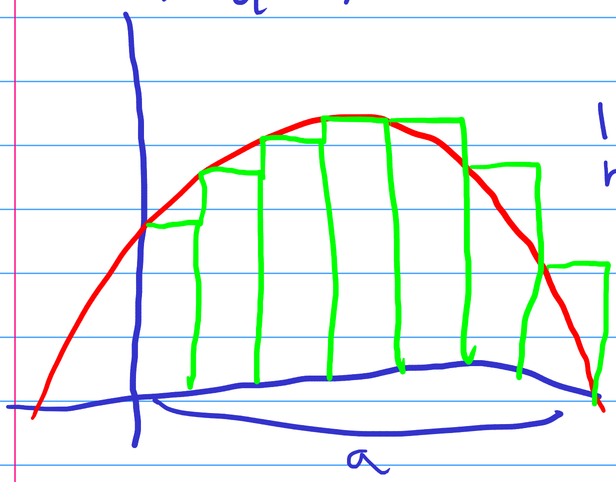
$f'(x)$	$f(x)$
$2\cos(2x)$	$\sin(2x)+C$

$$\int x^4\,dx = \frac{x^5}{5}+C$$

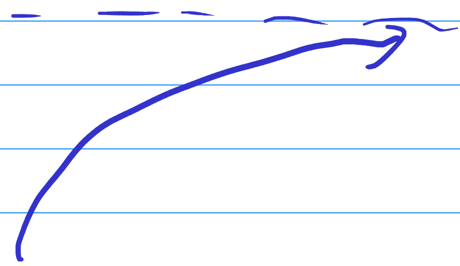


$$\sum_{i=1}^{50} \frac{1}{i^2} \qquad \sum_{i=1}^{\infty} \frac{1}{2^n}$$

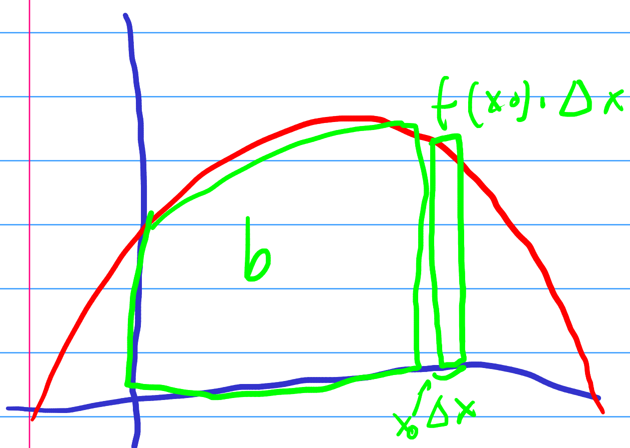
$y=4-x^2$



$$\lim_{n\to\infty} \frac{a}{n}\sum_{i=1}^{n} f\left(0+\frac{a}{n}\cdot i\right)$$



(x_2-x_1)



$$\lim_{h\to 0} \frac{f(x_0)\cdot h}{h}$$

FTC

$f(x)$ area under f from a to x call it $g(x)$
then
$g'(x) = f(x)$

$4-x^2$

area under
from
$x=0$ to $x=2$

$$\int_0^2 4-x^2\,dx = 5\tfrac{1}{3}$$

$$\int 4-x^2\,dx$$

$$4x - \frac{x^3}{3} + C$$

plug in 2

plug in 0

$$8 - \frac{8}{3} \cancel{+C}$$

$$-\left(0 + \frac{0}{3} \cancel{+C}\right)$$

$$\frac{16}{3} = 5\tfrac{1}{3}$$