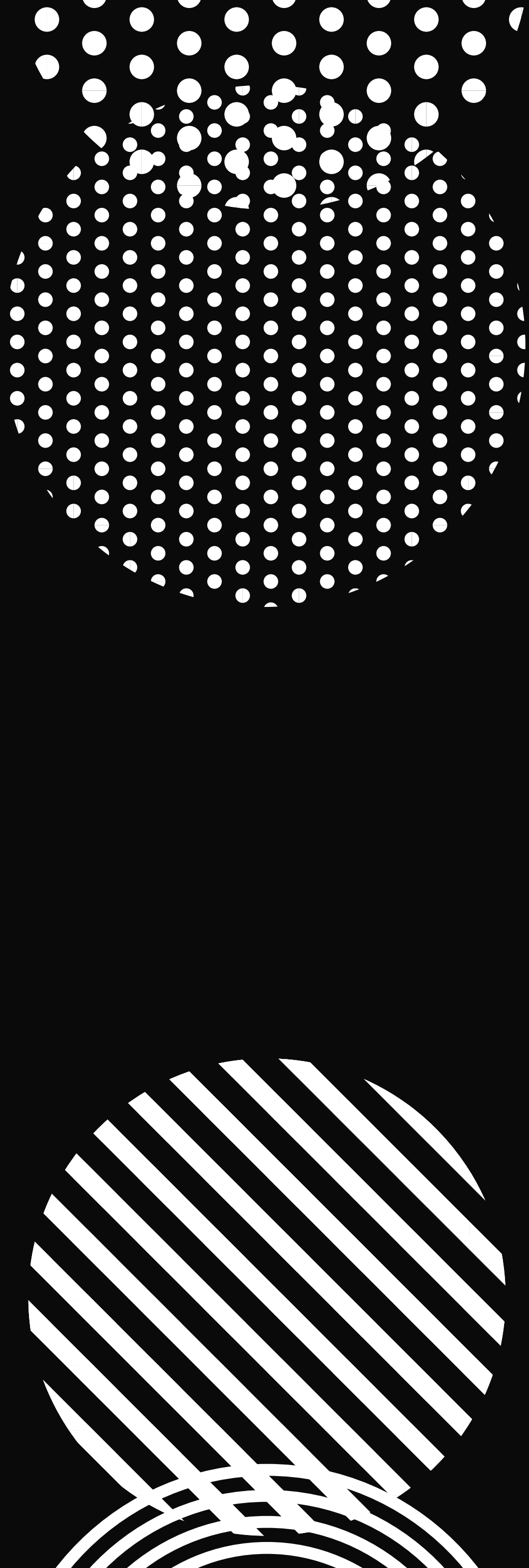

$$f(x) = \begin{cases} x+1 & x > 0 \\ x-1 & x < 0 \\ 0 & x = 0 \end{cases}$$

Compute $f'(0)$, $f'(1)$

$$f'(1) = \lim_{x \to 1} \frac{f(x) - f(1)}{x-1}$$

$$= \lim_{x \to 1} \frac{x+1-1+1}{x-1}$$

$$= \lim_{x \to 1} \frac{x-1}{x-1} = 1 = f'(1) \in \mathbb{R}$$

so $f$ is differentiable at $x = 1$

$$f'(0) = \lim_{x \to 0_+} \frac{f(x) - f(0)}{x - 0}$$

2 - 1 sided limits cuz 2 funcs in neighbourhood of 0.

$$= \lim_{x \to 0_+} \frac{x+1-0}{x-0}$$

$$= \lim_{x \to 0_+} \frac{x+1}{x} = \lim_{x \to 0_+} \left(1 + \frac{1}{x}\right)$$

$$= +\infty$$

$$\lim_{x \to 0^-} \frac{f(x) - f(0)}{x - 0}$$

$$= \lim_{x \to 0^-} \frac{x - 1 - 0}{x - 0} = \lim_{x \to 0^-} \left(1 - \frac{1}{x}\right)$$

$$= 1 - (-\infty) = +\infty$$

$$f'(0) = +\infty \notin \mathbb{R}$$

$$\boxed{f' : \mathbb{R} \to \mathbb{R}}$$

f is not differentiable at 0.

$$(f+g)' = f' + g'$$

$$(f \cdot g)' = f'g + fg'$$

$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$$

$$(f \circ g)' = (f(g))' = f'(g) \cdot g'$$

$f(x)$: $(5)' = 0$

$(x^3)' = 3x^2$

$(\sqrt{x})' = \frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{2\sqrt{x}}$

$(e^x)' = e^x$

$(a^x)' = a^x \cdot \ln a$

$(2^x)' = 2^x \cdot \ln(2)$

$(\ln x)' = \frac{1}{x}$

$(x^2 + 2^x)' = 2x + 2^x \cdot \ln(2)$

$(x \cdot 10^x)' = x \cdot 10^x \cdot \ln(10) + 10^x$

$a > 0$, $(a^x \cdot x^a)' = a^x \cdot \ln(a) \cdot x^a + a^x \cdot a \cdot x^{a-1}$

$= a^x \cdot x^a \cdot \ln(a) + a^{x+1} \cdot x^{a-1}$

$= a^x x^{a-1} (\ln a \cdot x + a)$

$$\left(\frac{1+e^x}{1-e^x}\right)' = \frac{e^x(1-e^x)-(1+e^x)(-e^x)}{(1-e^x)^2}$$

$$= \frac{2e^x}{(1-e^x)^2}$$

$$\left(2^{(3^x)}\right)' = 2^{3^x} \cdot \ln 2 \cdot 3^x \cdot \ln(3)$$

$$\left(e^{(-x^2)}\right)' = e^{-x^2} \cdot (-2x)$$

$$\left(2^{\frac{x}{\ln x}}\right)' = 2^{\frac{x}{\ln x}} \cdot \ln(2) \cdot \frac{\ln x - 1}{\ln^2 x}$$

$$\left(e^{\sqrt{x+1}}\right)' = e^{\sqrt{x+1}} \cdot \frac{1}{2\sqrt{x+1}}$$

$$(x^x)' = \left(e^{\ln x^x}\right)' = \left(e^{x \ln x}\right)'$$

$$= e^{x \cdot \ln x} (x \cdot \ln x)'$$

$$= x^{x}(\ln x + 1)$$

$$f(x) = \ln(x + \sqrt{1+x^2}),\ D_f,\ f',\ D_{f'}$$

$$x + \sqrt{1+x^2} > 0$$

$$1 + x^2 \geq 0 \text{ (always true)}$$

$$1+x^2 > x^2$$

$$\sqrt{1+x^2} > |x|$$

$$x + \sqrt{1+x^2} > x + |x| \geq 0$$

so $D_f = \mathbb{R}$

$$(\ln(x + \sqrt{1+x^2}))' = \frac{1}{x+\sqrt{1+x^2}} \cdot (x + \sqrt{1+x^2})'$$

$$= \frac{1}{x+\sqrt{1+x^2}} \cdot (1 + \frac{1}{2}(1+x^2)^{-\frac{1}{2}} \cdot 2x$$

$$= \frac{1}{x+\sqrt{1+x^2}} \cdot \left(1 + \frac{1}{2\sqrt{1+x^2}} \cdot 2x\right)$$

$$= \frac{1}{x+\sqrt{1+x^2}} \cdot \left(1 + \frac{x}{\sqrt{1+x^2}}\right)$$

$$= \frac{1}{x+\sqrt{1+x^2}} \cdot \frac{\sqrt{1+x^2}+x}{\sqrt{1+x^2}}$$

$$= \frac{1}{\sqrt{1+x^2}}$$

$D_{f'}$ : $1+x^2 > 0$ (always true)

$D_{f'} = \mathbb{R}$

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$f(x) = \ln\sqrt{1-x}$

$\sqrt{1-x} > 0$

$1-x > 0$

$x < 1$

$D_f = \{x < 1, x \in \mathbb{R}\}$

$$f' = \frac{1}{\sqrt{1-x}} \cdot \frac{1}{2} \cdot \frac{1}{\sqrt{1-x}} (-1) = \frac{1}{2x-2}$$

$\mathbb{R} \setminus \{1\}$

$D_{f'} : (-\infty, 1).\quad D_f \cap (\mathbb{R} \setminus \{1\})$

$$f'' = ((2x-2)^{-1})' = 2^{-1}(-1)(x-1)^{-2}$$

$$= \frac{-1}{2(x-1)^2}$$

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

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

$$(\sin(\sin x))' = \cos(\sin x) \cdot \cos x$$

$$\left(\sqrt{tg\frac{x}{2}}\right)' = \left(\left(tg\frac{x}{2}\right)^{\frac{1}{2}}\right)'$$

$$= \frac{1}{2}\cdot\left(tg\frac{x}{2}\right)^{-\frac{1}{2}}\cdot\left(tg\frac{x}{2}\right)'$$

$(tg(x))' = \dfrac{1}{\cos^2 x}$

$$= \frac{1}{2\sqrt{tg\frac{x}{2}}}\cdot\frac{1}{\cos^2\frac{x}{2}}\cdot\frac{1}{2}$$

$$\left(\arcsin\frac{2}{x}\right)' = \frac{1}{\sqrt{1-\left(\frac{2}{x}\right)^2}}\cdot\frac{-2}{x^2}$$

$\left(\dfrac{2}{x}\right)' = 2\cdot x^{-1}$

$= -2\cdot x^{-2}$

$= \dfrac{-2}{x^2}$

$(\arcsin x)' = \dfrac{1}{\sqrt{1-x^2}}$

$$\left(\frac{x}{1+x^2} - \operatorname{arctg} x\right)'$$

$(\operatorname{arctg}(x))' = \dfrac{1}{1+x^2}$

$$\frac{1+x^2-2x(x)}{(1+x^2)^2} - \frac{1}{(1+x^2)}$$

$$= \frac{1-x^2}{(1+x^2)^2} - \frac{1}{(1+x^2)}$$

$$= \frac{1 - x^2 - 1 - x^2}{(1+x^2)^2}$$

$$= \frac{-2x^2}{(1+x^2)^2}$$

6.20.

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

$b \in \mathbb{R}$

1. $D_f = \mathbb{R}$

$f'(x)$: $x \geq 2$, $f'(x) = \dfrac{1}{2\sqrt{x-2}}$, $(2, +\infty)$

$x < 2$, $f'(x) = -2b(x-2)$, $(-\infty, 2)$

$D_{f'} = \mathbb{R} \setminus \{2\}$

$$\lim_{x \to 2_-} \frac{f(x) - f(2)}{x-2} = \lim_{x \to 2_-} \frac{1 - b(x-2)^2 - 0}{x-2}$$

$$= \lim_{x \to 2_-} \left( \frac{1}{x-2} - b(x-2) \right)$$

$$= -\infty$$

$$\lim_{x \to 2_+} \frac{\sqrt{x-2} - 0}{x-2} = \lim_{x \to 2_+} \frac{1}{\sqrt{x-2}}$$

$$= +\infty$$

4

0100

$\xleftarrow{1}$

1000

8

← r16

2* ~~8~~ r16

\+ ~~8~~ r16

---

3* r16

0100

1000

0000

6 - 2

6 + (-2)

5

0101

2

0010 → 1

4B     4    B

0100    1011

0000 0100

(0-9) ---- (A-F)

ASCII - 41 - '0'

r16 - value
r17 - position

4 + 30 = 34

A , 00

A - F      10 + 'A'

10 - 10

0 + 'A' = 'A'

C

12 - 10 + 'A'

'A' + 2

0100 1011
and 0000 1111 0x0F

0000 1011

0100 1011
0000 0111

0000 0011