
$$f(x) = \frac{1}{2} k (x-3)^2$$

$$E = \frac{1}{2} k x^2$$

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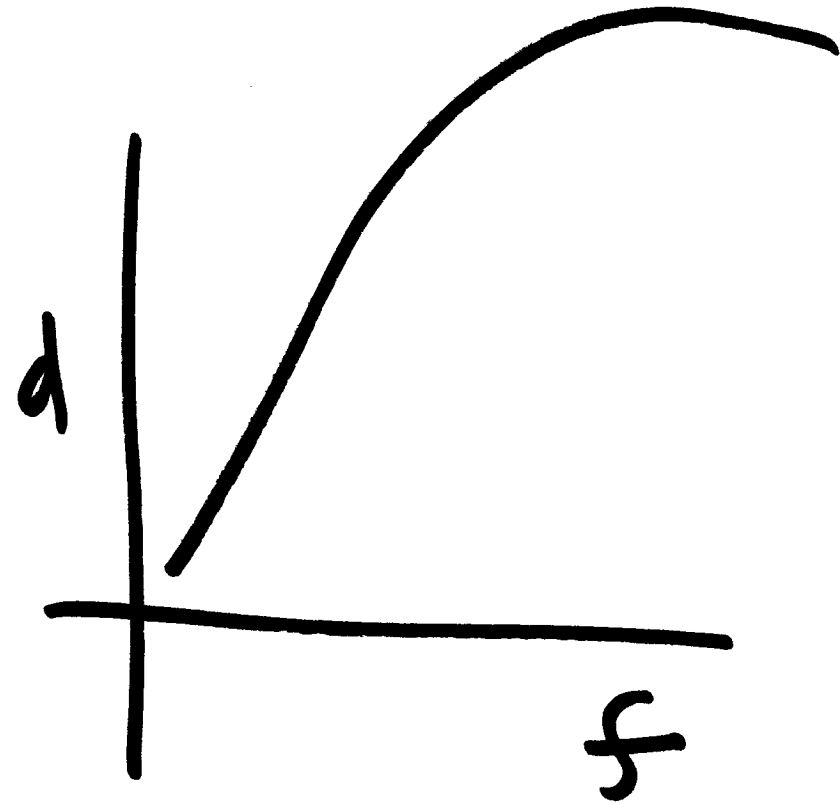
$$-\frac{dE}{dx} = -\frac{1}{2} \frac{d}{dx} [kx^2]$$

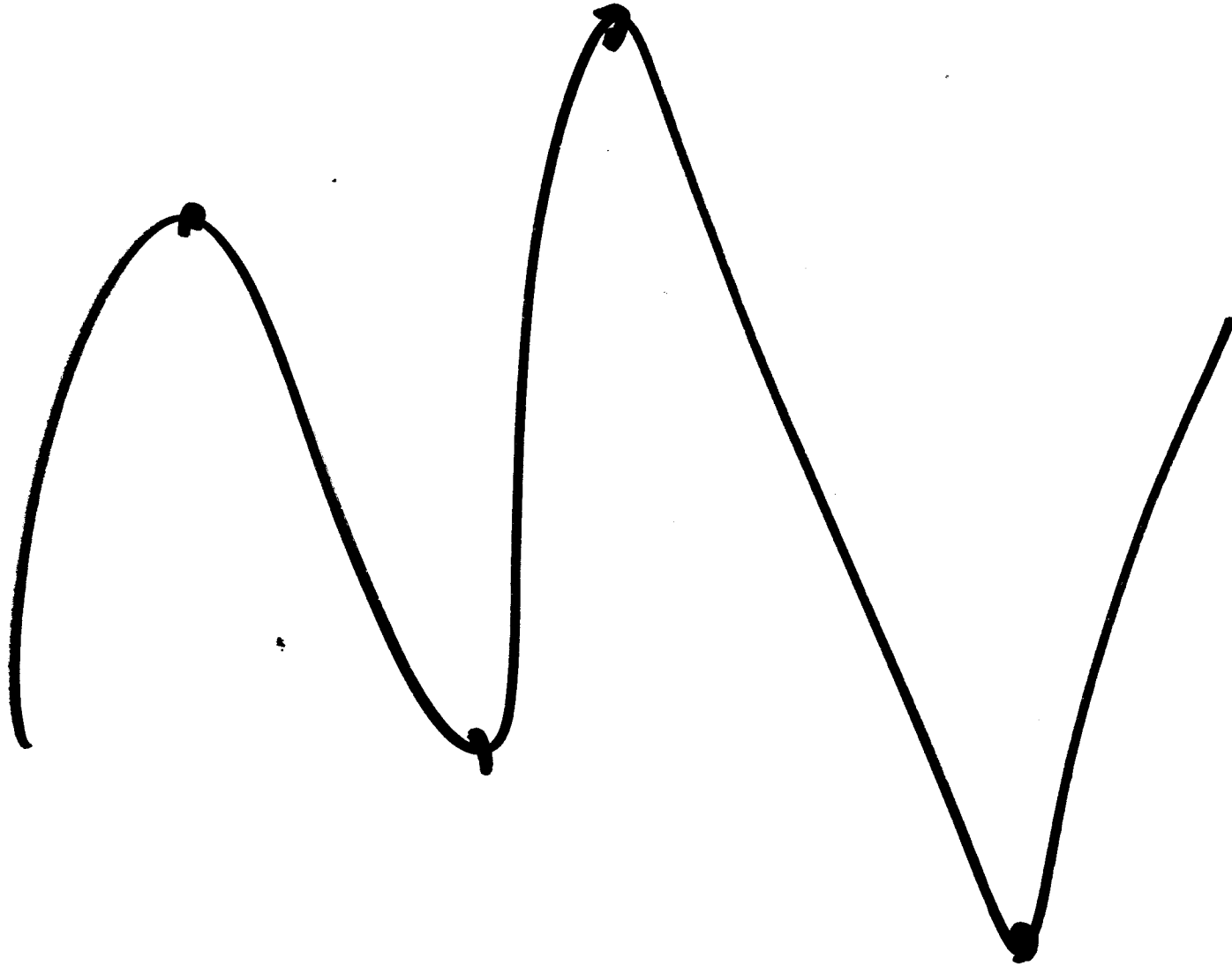
$$= -\frac{k}{2} \frac{d}{dx} x^2$$

$$= -\frac{k}{2} \cdot 2x = \underline{\underline{-kx}}$$

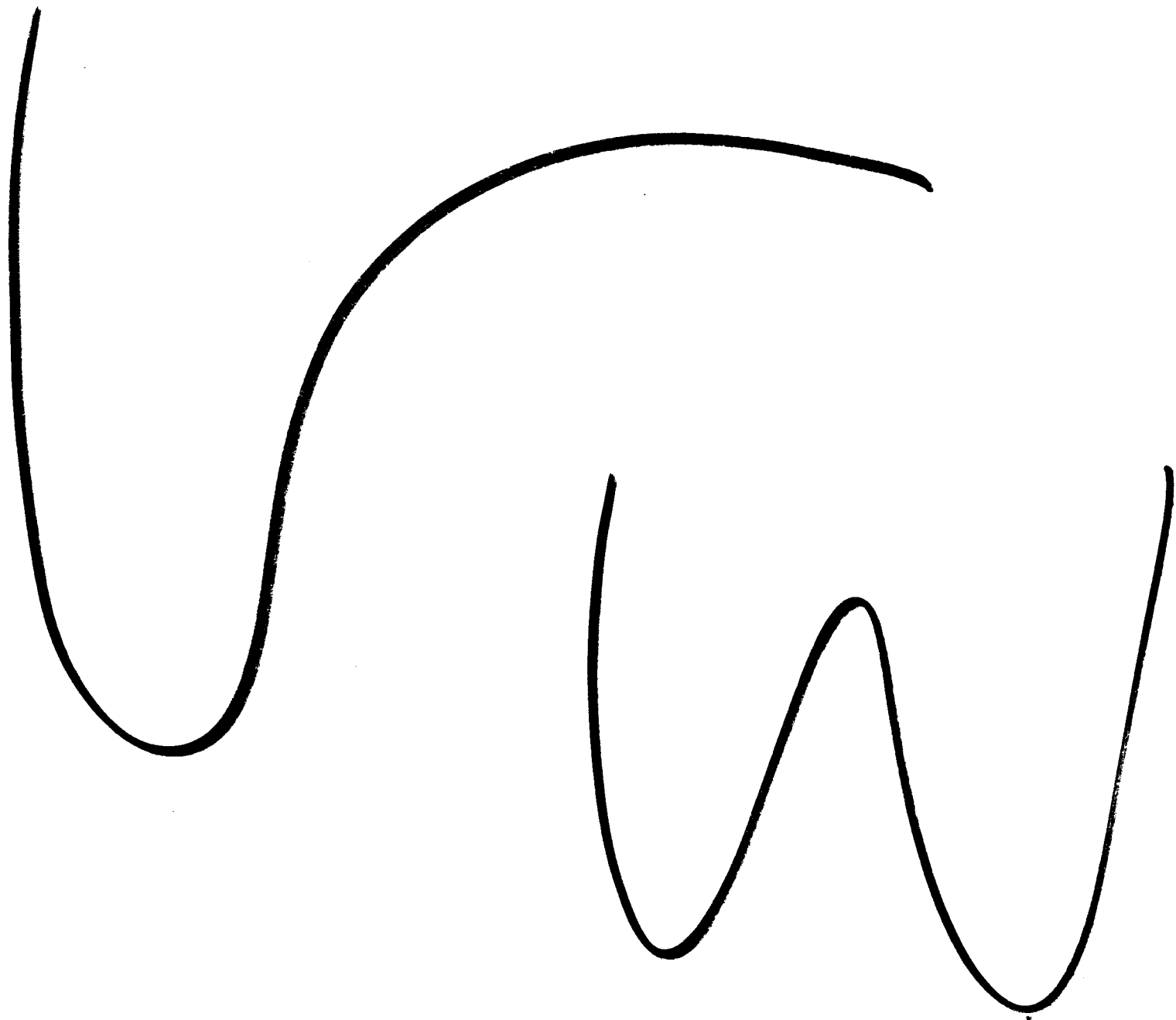
$$G(\tau, f)$$

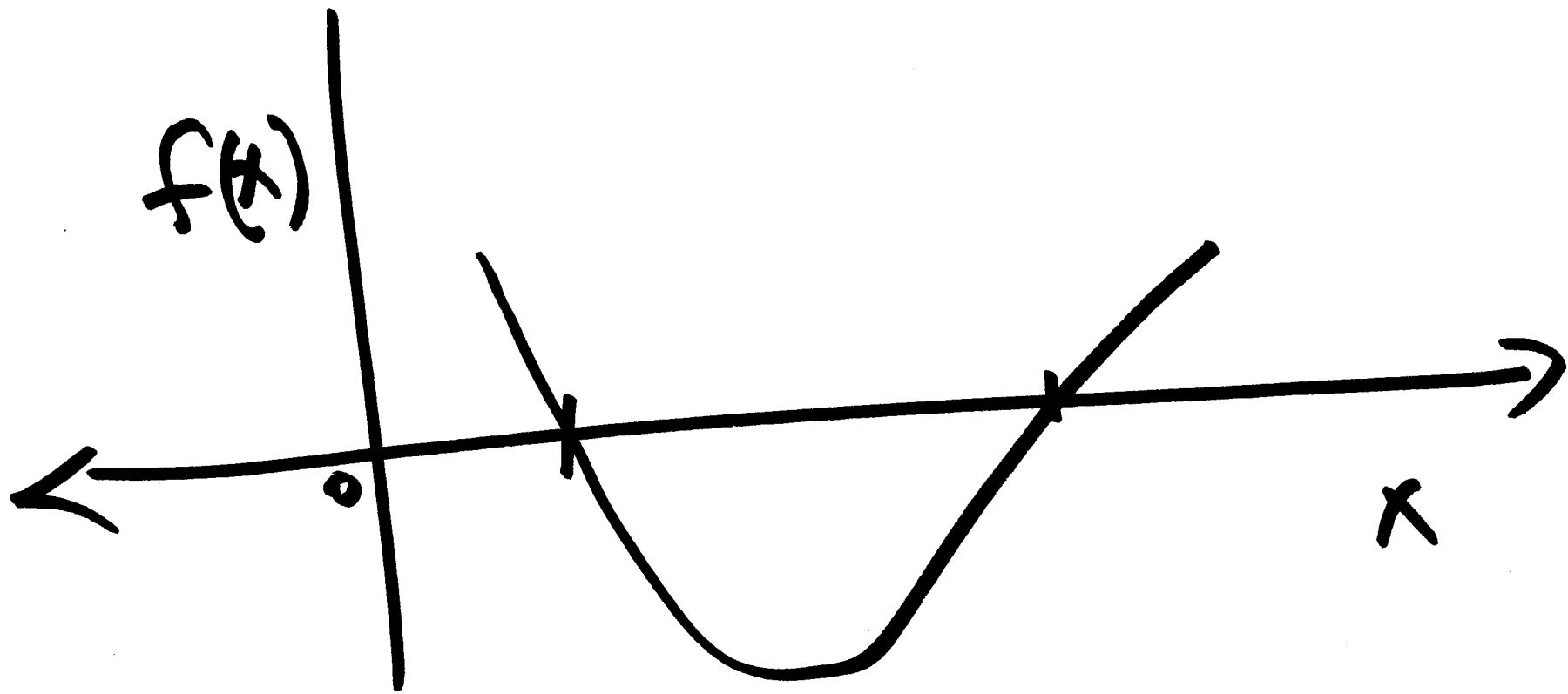
$$d = \frac{dG}{df}$$





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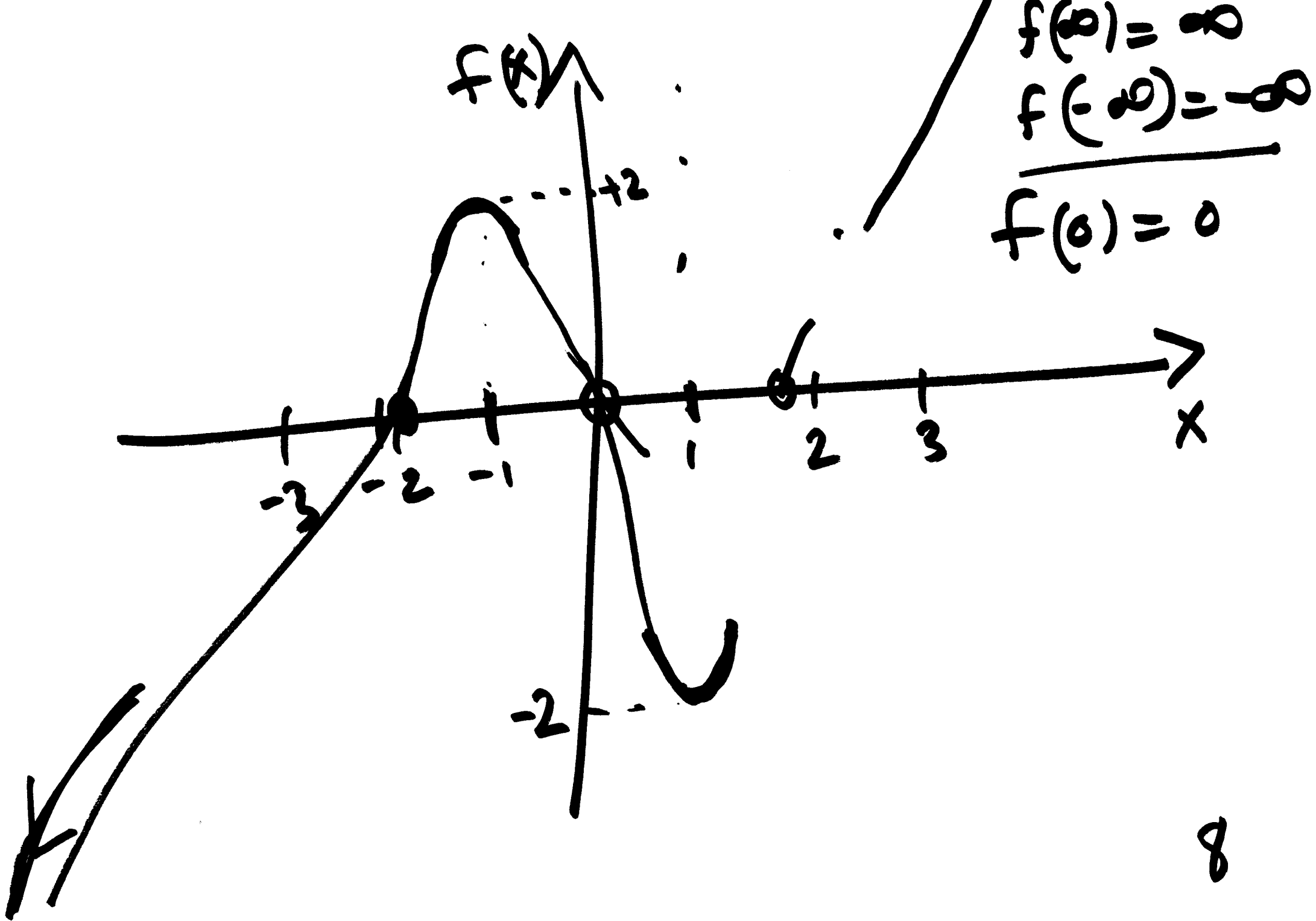
$$f(x) = x^3 - 3x$$

$$f(x = +\infty) = \infty^3 - 3\infty$$

$$\Rightarrow f(\infty) \rightarrow \infty$$

$$f(x = -\infty) \rightarrow -\infty$$

$$\begin{array}{l|l} f(x=0) & x^3 - 3x \\ \hline \Rightarrow \underline{f(x=0) = 0} & \end{array}$$



$$x^3 - 3x = 0$$

$$\Rightarrow x^2 - 3 = 0$$

$$\Rightarrow x^2 = 3$$

$$\Rightarrow x = \pm \sqrt{3}$$

$$f(x) = x^3 - 3x$$

$$\frac{df}{dx} = 3x^2 - 3$$

$$\Rightarrow 3x^2 - 3 = 0 \Rightarrow 3x^2 = 3$$

$$\Rightarrow x^2 = 1 \Rightarrow x = \pm 1$$

$$f = x^3 - 3x$$

$$\frac{df}{dx} = 3x^2 - 3$$

$$\frac{d^2f}{dx^2} = 6x$$

$$x = +1$$

$$\begin{aligned} \frac{d^2f}{dx^2} &= 6x = 6(1) \\ &= \underline{\underline{6}} > 0 \end{aligned}$$

\Rightarrow a minimum

||

$$\frac{d^2f}{dx^2} = 6x$$

at $x = +1 \Rightarrow \frac{d^2f}{dx^2} = 6 > 0 \Rightarrow$ minimum

at $x = -1 \Rightarrow \frac{d^2f}{dx^2} = \underline{\underline{-6 < 0}}$

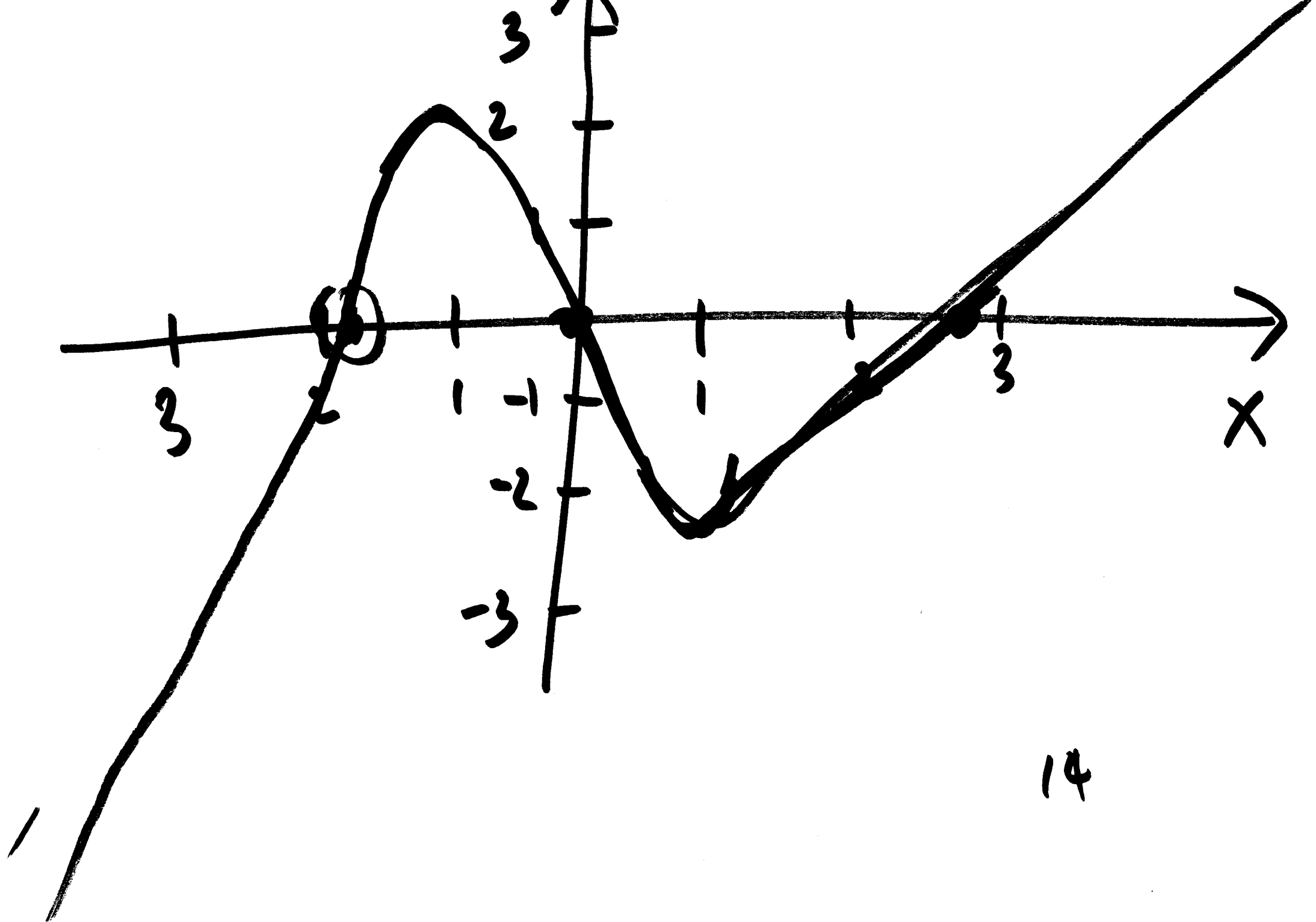
\Rightarrow maximum

$$x^3 - 3x$$

$$x = +1 \Rightarrow 1^3 - (3 \cdot 1) = 1 - 3$$

$$= \underline{\underline{-2}}$$

$$x = -1 \Rightarrow -1 + 3 = \underline{\underline{+2}}$$



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$$f(x) = \frac{A}{x^{12}} - \frac{B}{x^6}$$

$$A > 0$$

$$B > 0$$

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$$\frac{A}{x^{12}} - \frac{B}{x^6}$$

~~$x > 0$~~
 $x \geq 0$



$$\frac{A}{x^{12}} - \frac{B}{x^6} = 0$$

$$\Rightarrow \Rightarrow \frac{A}{x^{12}} = \frac{B}{x^6} \Rightarrow \frac{A}{B} = \frac{x^{12}}{x^6}$$

~~$$\frac{x^6}{x^{12}} = \frac{B}{A} \Rightarrow \frac{A}{B} = x^6$$~~

when $x = \left(\frac{A}{B}\right)^{1/6}$

$$f(x) = 0$$

$$f(x=0) = \frac{A}{0} - \frac{B}{0} = \infty$$

$$\frac{df}{dx} = \frac{d}{dx} \left[\frac{A}{x^{12}} - \frac{B}{x^6} \right]$$

$$= -12A x^{-13} + 6B x^{-7}$$

$$\frac{df}{dx} = 0 \Rightarrow \frac{x^{13}}{x^{-7}} = \frac{12A}{6B}$$

$$\frac{-\cancel{2}A}{x^{\cancel{13}^2}} = \frac{-\cancel{6}B}{x^7}$$

$$\frac{2A}{B} = x^6$$

$$x = \sqrt[6]{\frac{2A}{B}} = \left(\frac{2A}{B}\right)^{1/6}$$

$f(x)$

$$\frac{A}{x^{12}} - \frac{B}{x^6}$$

