# Interpretação geomêtrica da derivada

consideramos a função $f(x) = x^2$

e graficamos as retas que passam pelos pontos

$(1, f(1))$ $(5, f(5))$ gráfico A

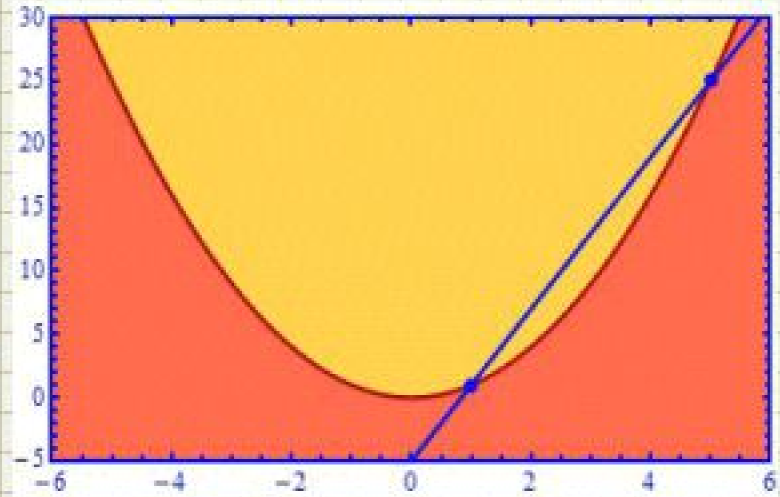
$(1, f(1))$ $(4, f(4))$ B

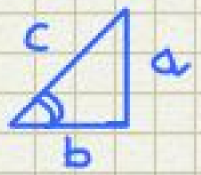
$(1, f(1))$ $(3, f(3))$ C

$(1, f(1))$ $(2, f(2))$ D

calculando o ângulo formado com o eixo $x$

GRÁFICO A






$c \operatorname{sen}\alpha = a$

$c \cos\alpha = b$

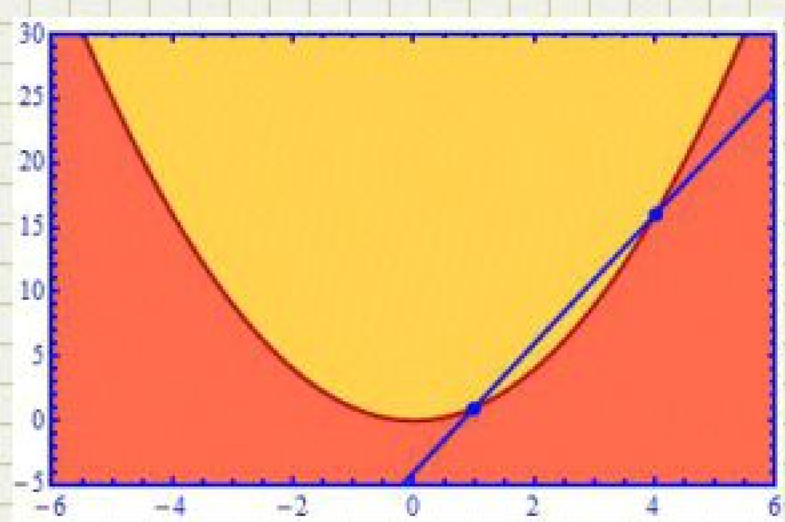
$a/b = \tan\alpha$

$a = f(5) - f(1) = 25 - 1 = 24$

$b = 5 - 1 = 4$

$\boxed{\tan\alpha = 6}$

$\alpha = 80.54°$

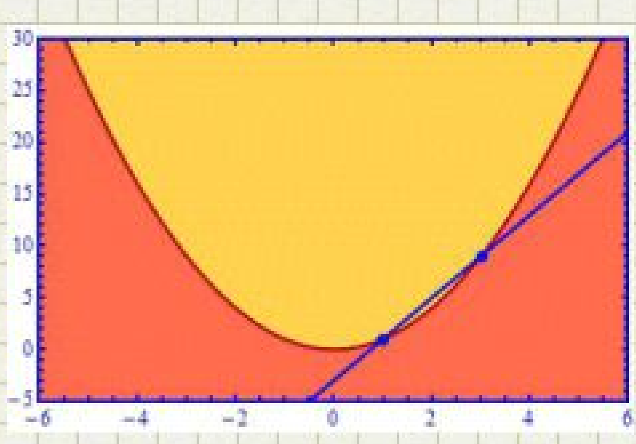


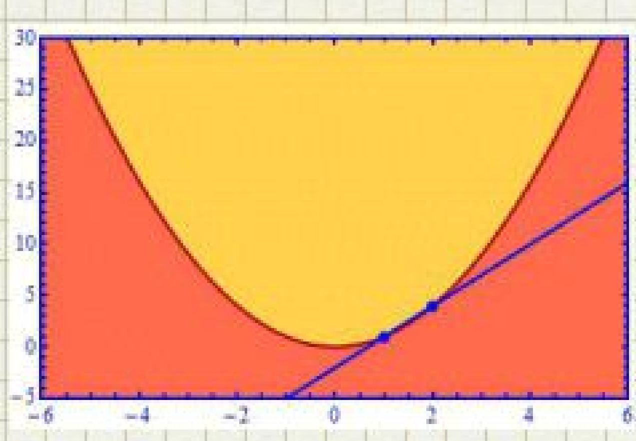
$a = f(4) - f(1) = 16 - 1 = 15$

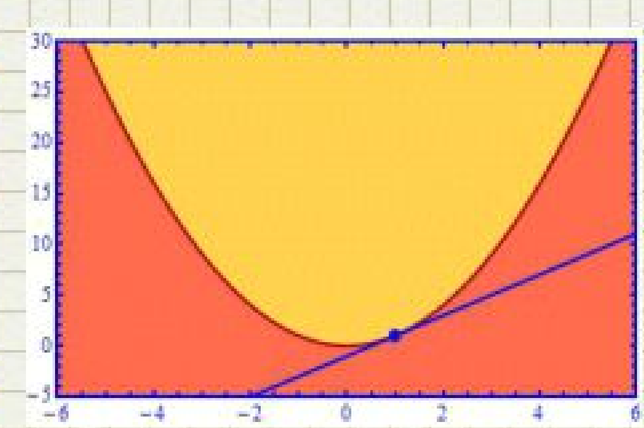
$b = 4 - 1 = 3$

$\boxed{\tan\alpha = 5}$

$\alpha = 78.69°$







$a = 9 - 1 = 8$

$b = 3 - 1 = 2$

$\boxed{\tan\alpha = 4}$

$\alpha = 75.96°$

$a = 4 - 1 = 3$

$b = 2 - 1 = 1$

$\boxed{\tan\alpha = 3}$

$71.57°$

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

$f'(x)$

$\tan\alpha = f'(1)$

$$\lim_{\Delta x \to 0} \frac{(x+\Delta x)^2 - x^2}{\Delta x} = \lim_{\Delta x \to 0} \frac{\cancel{x^2} + 2x\Delta x + \Delta x^2 - \cancel{x^2}}{\Delta x}$$

$$= \lim_{\Delta x \to 0} (2x + \Delta x) = 2x$$

$f(x) = x^2$ $\quad$ $f'(x) = 2x$ $\quad$ $f'(1) = 2$ $\quad$ $\boxed{\tan\alpha = 2}$

$\alpha = 63.43°$

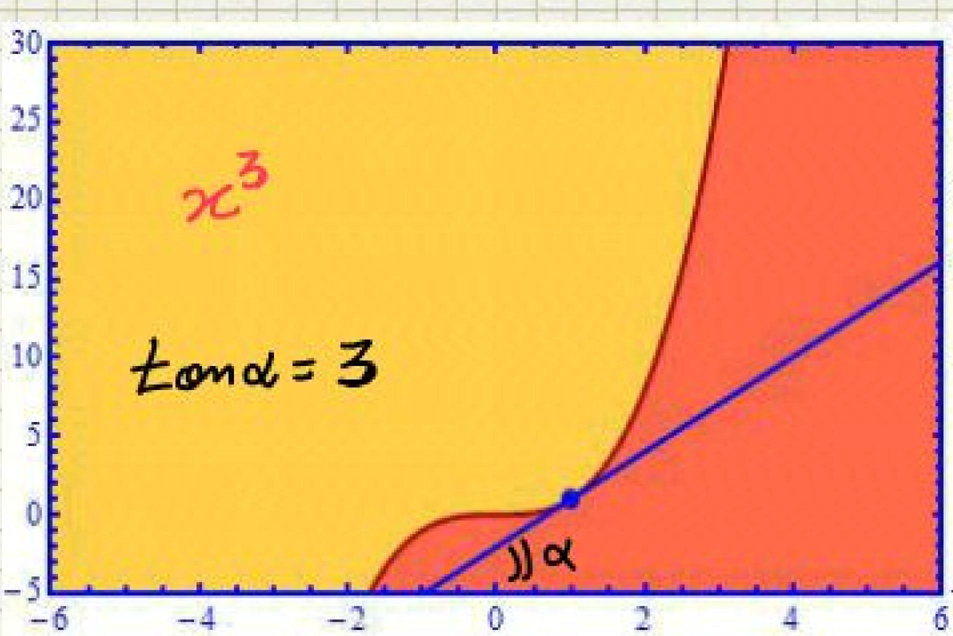
$f(x) = x^n$ $\quad$ $f'(x) = ?$

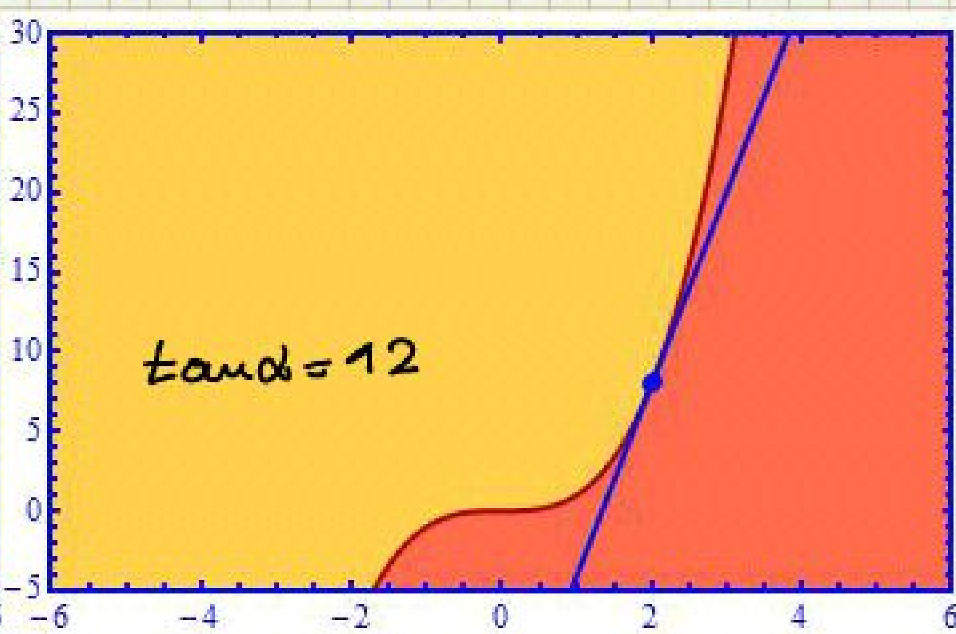
$$\lim_{\Delta x \to 0} \frac{(x+\Delta x)^n - x^n}{\Delta x} = \lim_{\Delta x \to 0} \left( n x^{n-1} + \dots \Delta x + \dots \Delta x^2 + \dots \right)$$

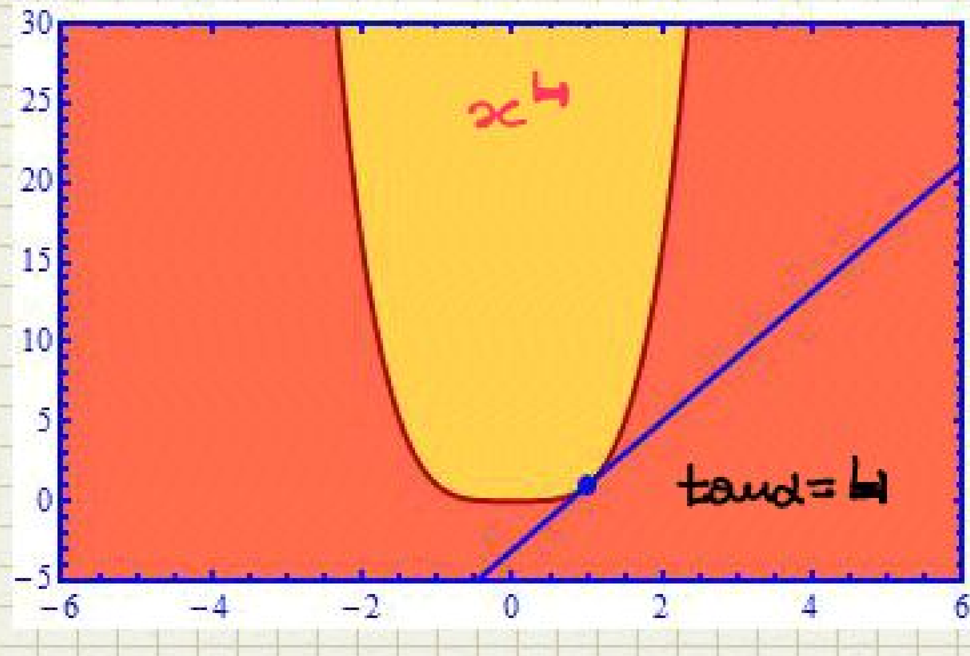
$$\boxed{n x^{n-1}}$$

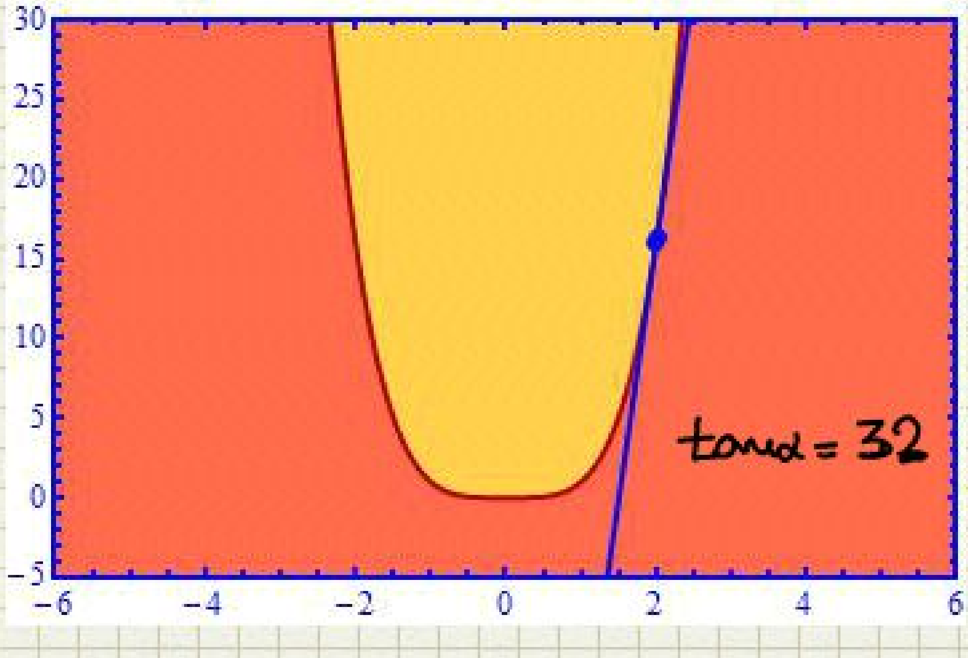
$f(x) = x^3$ $\quad$ $f'(1) = 3$ $\quad$ $f'(2) = 12$ $\quad$ $f'(x) = 3x^2$

$f(x) = x^4$ $\quad$ $f'(1) = 4$ $\quad$ $f'(2) = 32$ $\quad$ $f'(x) = 4x^3$

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|---|---|---|---|---|---|
| $\tan\alpha = 1$ | [45°] | 5 | [78.690°] | 16 | [86.424°] |
| $\tan\alpha = 2$ | [63.435°] | 6 | [80.538°] | 32 | [88.210°] |
| $\tan\alpha = 3$ | [71.565°] | 7 | [81.870°] | 64 | [89.105°] |
| $\tan\alpha = 4$ | [75.964°] | 8 | [82.875°] | 128 | [89.552°] |