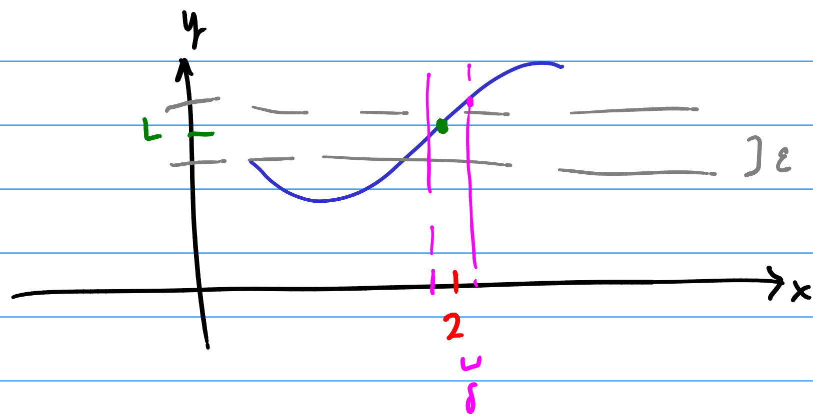
$\lim\limits_{x \to 2} 12x-4 = 20$ $\qquad \varepsilon > 0 \qquad$ Find $\delta = \delta(\varepsilon)$.

if $|x-2| < \delta$, then $|f(x)-L| < \varepsilon$

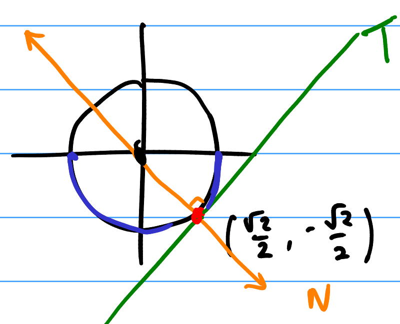
$$|f(x)-L| = |12x-4-20| = |12x-24| = 12|x-2| < 12\delta = \varepsilon$$

So, $\boxed{\delta = \frac{\varepsilon}{12}}$



$$x_{k+1} = x_k - \frac{f(x_k)}{f'(x_k)}$$

$\frac{d}{dx}\left[x^2+y^2=1\right]$



N: $y = \underset{-\frac{\sqrt{2}}{2}}{y_0} - \underbrace{\frac{1}{dy/dx}}\,(x - \underset{\frac{\sqrt{2}}{2}}{x_0})$

$2x + 2y\frac{dy}{dx} = 0$

$\frac{dy}{dx} = \frac{-x}{y}\Big|_{\left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)} = 1$ slope of T slope of N : $-\frac{1}{1} = -1$

$$y = -\frac{\sqrt{2}}{2} - \left(x - \frac{\sqrt{2}}{2}\right) = -x \qquad \boxed{y = -x}$$

$f(x) = \underbrace{\boxed{6x\sin x}}$ $0 \le x \le \pi$ Find the abs. max.

Endpts. $f(0) = 0$

$f(\pi) = 6\pi \sin\pi = 0$

$\cancel{6}\sin x = -\cancel{6}x\cos x$

$1 = -x\cot x$

$\cot x = \frac{-1}{x}$

$\boxed{\tan x = -x}$

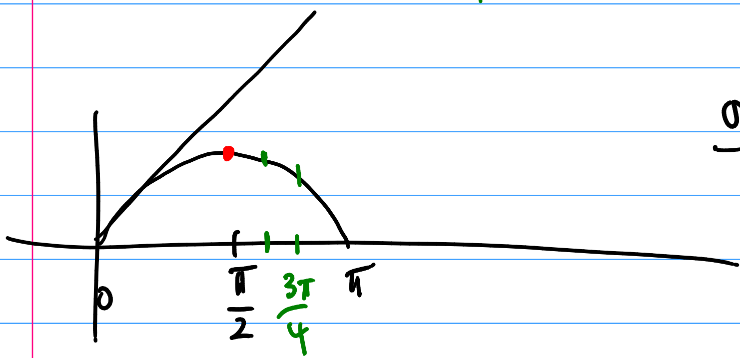
$\boxed{F(x)} = f'(x) = \underbrace{6\sin x + 6x\cos x = 0}$

$$x_{k+1} = x_k - \frac{F(x_k)}{F'(x_k)}$$

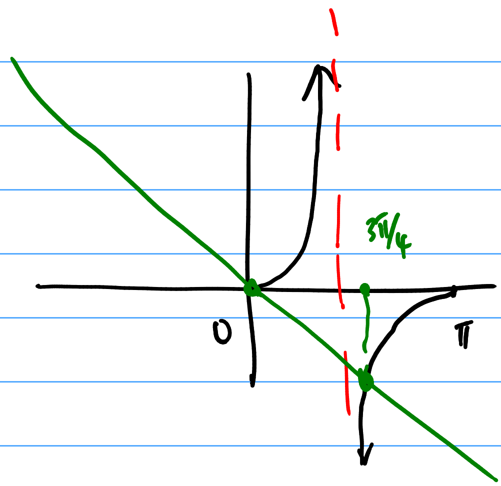
$$= x_k - \frac{6\sin(x_k) + 6x_k\cos(x_k)}{6\cos(x_k) + 6\cos(x_k) - 6x_k\sin(x_k)}$$

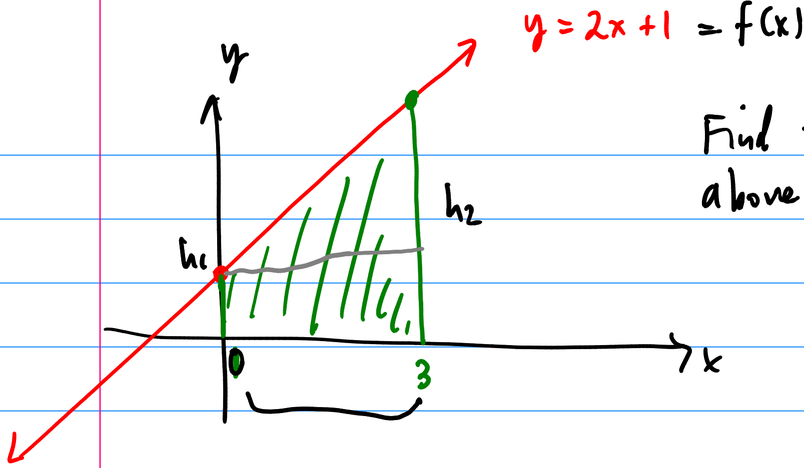
$$x_{k+1} = x_k - \frac{\sin(x_k) + x_k\cos(x_k)}{2\cos(x_k) - x_k\sin(x_k)}$$

$$x_1 = \frac{3\pi}{4}$$



or





Find the area under the graph $y=2x+1$, above the x-axis, between $x=0$, $x=3$.

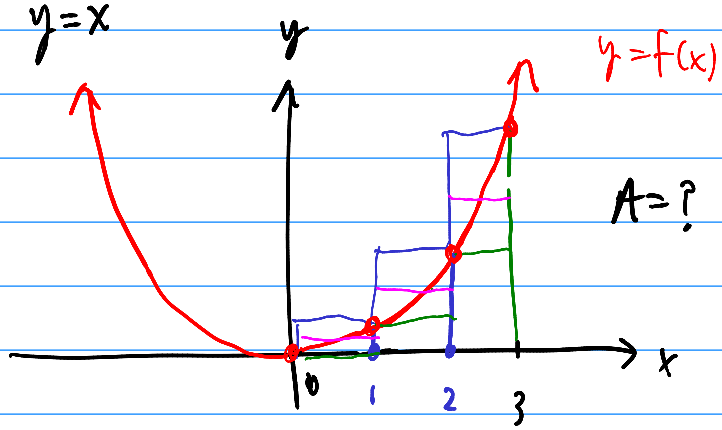
$h_1 = f(0) = 2\cdot 0+1 = 1$

$h_2 = f(3) = 2\cdot 3+1 = 7$

$$A = \frac{1}{2}(h_1+h_2)\cdot b$$

$$A = \frac{1}{2}(1+7)\cdot 3 = 4\cdot 3 = 12$$

Ex. $y=x^2$



$A = ?$

Approximate. $A \approx$ sum of area of rectangles.

$$\text{Area}(R) = bh = 1\cdot f(x_k)$$

Right: $A \approx 1\cdot 1^2 + 1\cdot 2^2 + 1\cdot 3^2 = 1+4+9 = 14$ over estimate

Left: $A \approx 1\cdot 0^2 + 1\cdot 1^2 + 1\cdot 2^2 = 0+1+4 = 5$ underestimate

(*) Idea: To get a better approximation, take (a lot) more boxes.
or use trapezoids.