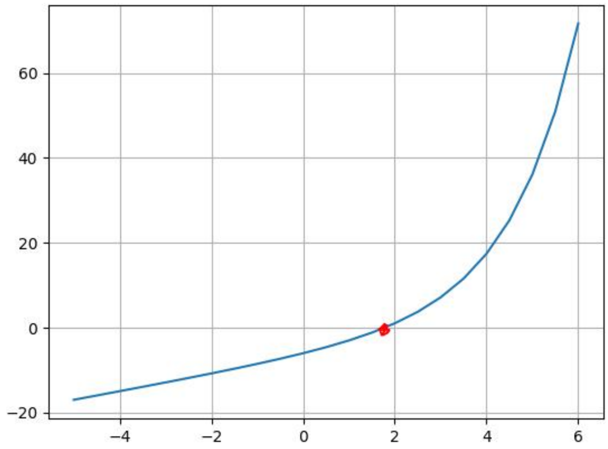
Find the root of the following equation:
$y = f(x) = e^{0.7x} + 2x - 7 = 0$
by using the Newton-Raphson Method with initial guess $x_0 = 5$ and tolerance $\varepsilon = 10^{-3}$

Solution:



To use this method, we need to calculate the first differentiation of $f(x)$
$f'(x) = 0.7e^{0.7x} + 2$

$y = f(x = 5) = 36.11545$
Since $|y_r| > \varepsilon$, then we continue to the iteration

Iteration 1: --

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 5 - \frac{f(5)}{f'(5)} = 3.56576$$

$y_1 = f(x_1) = 12.26572$
Since $|y_1| > \varepsilon$, then we continue the iteration

Iteration 2: --

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} = 3.56576 - \frac{f(3.56576)}{f'(3.56576)} = 2.39692$$

$y_2 = f(x_2) = 3.14783$
Since $|y_2| > \varepsilon$, then we continue the iteration

Iteration 3: --

$$x_3 = x_2 - \frac{f(x_2)}{f'(x_2)} = 2.39692 - \frac{f(2.39692)}{f'(2.39692)} = 1.84926$$

$y_3 = f(x_3) = 0.34762$
Since $|y_3| > \varepsilon$, then we continue the iteration

Iteration 4: --

$$x_4 = x_3 - \frac{f(x_3)}{f'(x_3)} = 1.84926 - \frac{f(1.84926)}{f'(1.84926)} = 1.77293$$

$y_4 = f(x_4) = 0.00512$
Since $|y_4| > \varepsilon$, then we continue the iteration

Iteration 5: --

$$x_5 = x_4 - \frac{f(x_4)}{f'(x_4)} = 1.77293 - \frac{f(1.77293)}{f'(1.77293)} = 1.77177$$

$y_5 = f(x_5) = 1.1347 \times 10^{-6}$
Since $|y_5| > \varepsilon$, then we stop the iteration. The solution is $x = 1.77177$