

Calculus I, Section 3.3, #26
 Derivatives of Trigonometric Functions

- (a) Find an equation of the tangent line to the curve $y = 3x + 6 \cos(x)$ at the point $(\pi/3, \pi + 3)$.¹

We are given a point on the tangent line, $(\pi/3, \pi + 3)$, so we just need to find the slope at that point.

If

$$y = 3x + 6 \cos(x)$$

then

$$y' = 3 - 6 \sin(x)$$

and

$$\begin{aligned} y' \left(\frac{\pi}{3} \right) &= 3 - 6 \sin \left(\frac{\pi}{3} \right) \\ &= 3 - 6 \cdot \frac{\sqrt{3}}{2} \\ &= 3 - 3\sqrt{3} \end{aligned}$$

so

$$y' \left(\frac{\pi}{3} \right) = 3 - 3\sqrt{3}$$

We use point-slope form for a line

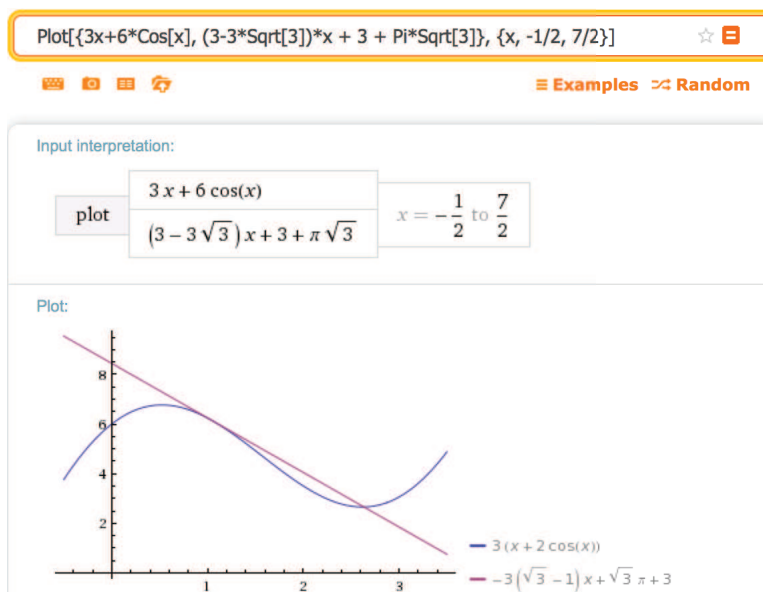
$$y - y_1 = m(x - x_1)$$

so

$$\begin{aligned} y - (\pi + 3) &= (3 - 3\sqrt{3}) \left(x - \frac{\pi}{3} \right) \\ y &= 3x - 3 \cdot \frac{\pi}{3} - 3\sqrt{3}x + 3\sqrt{3} \cdot \frac{\pi}{3} + \pi + 3 \\ y &= (3 - 3\sqrt{3})x + 3 + \pi\sqrt{3} \end{aligned}$$

- (b) Illustrate part[(a)] by graphing the curve and the tangent line on the same screen.

From WolframAlpha



¹Stewart, *Calculus, Early Transcendentals*, p. 196, #26.