

- 6 1. Using a limit of slopes of secant lines, find the slope of  $y = (x - 1)^2$  at  $P = (3, 4)$  and the equation of the tangent line through this point.

*Solution.* Let  $Q$  be the point  $(3+h, (3+h-1)^2)$ . Notice that  $(3+h-1)^2 = (2+h)^2 = 4 + 4h + h^2$ . The slope of the line through  $P$  and  $Q$  is

$$\frac{(4 + 4h + h^2) - 4}{3 + h - 3} = \frac{4h + h^2}{h} = 4 + h.$$

Taking the limit as  $h$  approaches 0 gives 4.

So the tangent line has slope 4 and goes through  $(3, 4)$ . Using the slope-point equation for a line, the tangent line is

$$y - 4 = 4(x - 3).$$

This simplifies to  $y = 4x - 8$ .

- 4 2. Graph the function  $y = \cos(x + \pi/4) - 3$ . What is its period?

*Solution.* This function is  $y = \cos(x)$  translated left by  $\pi/4$  and down by 3. Because it is not scaled, the period of  $y = \cos(x + \pi/4) - 3$  is the same as that of  $y = \cos(x)$ , namely  $2\pi$ .

graph to follow.