

<b>06</b>	<b>2c</b>	Find the equation of the tangent to the curve $y = \cos 2x$ at the point whose $x$ -coordinate is $\frac{\pi}{6}$ .	<b>3</b>
Subs $x = \frac{\pi}{6}$ into $y = \cos 2x$ : $y\left(\frac{\pi}{6}\right) = \cos 2\left(\frac{\pi}{6}\right)$ $= \cos \frac{\pi}{3}$ $= \frac{1}{2} \quad \therefore \left(\frac{\pi}{6}, \frac{1}{2}\right)$ $y' = \cos 2x$ $= -2 \sin 2x$ $y'\left(\frac{\pi}{6}\right) = -2 \sin 2\left(\frac{\pi}{6}\right)$ $= -2 \sin \frac{\pi}{3}$ $= -2 \times \frac{\sqrt{3}}{2}$ $= -\sqrt{3} \quad \therefore \text{gradient of } -\sqrt{3}$		Equation: $y - y_1 = m(x - x_1)$ , using $\left(\frac{\pi}{6}, \frac{1}{2}\right)$ and $m = -\sqrt{3}$ $y - \frac{1}{2} = -\sqrt{3}\left(x - \frac{\pi}{6}\right)$ $y - \frac{1}{2} = -\sqrt{3}x + \frac{\sqrt{3}\pi}{6}$ $y = -\sqrt{3}x + \frac{\sqrt{3}\pi}{6} + \frac{1}{2}$	

\* These solutions have been provided by *projectmaths* and are not supplied or endorsed by the Board of Studies

### Board of Studies: Notes from the Marking Centre

Answering this part of the question entailed three basic steps: finding the slope of the tangent, determining a point that the tangent passes through, and hence determining the equation of the tangent.

The slope of the tangent is given by  $f'\left(\frac{\pi}{6}\right)$ . Common errors in this step included: not

correctly differentiating  $\cos 2x$ , not substituting  $x = \frac{\pi}{6}$  into the derivative, incorrectly

evaluating  $-2 \sin \frac{2\pi}{6}$ , using the slope of the normal, or using a slope not obtained from differentiation at all, for example  $m = \cos 2$ .

The tangent passes through the point  $\left(\frac{\pi}{6}, \cos \frac{2\pi}{6}\right)$ . Common errors in this step included:

using the point obtained from letting  $x = 0$ , not substituting  $x = \frac{\pi}{6}$  into  $\cos 2x$ , incorrectly

evaluating  $\cos \frac{2\pi}{6}$ , or using 30 for the abscissa of the point. Even for candidates who

correctly completed the first two steps, errors were made in putting the information together to find the equation of the tangent. The majority of these errors seemed to be

careless errors, such as writing  $\frac{\pi}{3}$  instead of  $\frac{\pi}{6}$ , or writing  $\sqrt{3}$  instead of  $-\sqrt{3}$ .

Source: [http://www.boardofstudies.nsw.edu.au/hsc\\_exams/](http://www.boardofstudies.nsw.edu.au/hsc_exams/)