

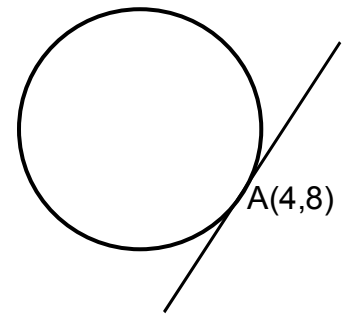
Higher Mathematics - Homework C

Non-calculator section:

- (a) Show that $(x + 4)$ is a factor of $f(x) = x^3 + 2x^2 - 7x + 4$.
(b) Hence solve $f(x) = 0$.
- Find the equation of the line through the point $(-1, 5)$ which is perpendicular to the line with equation $2x + 3y = 1$.
- (a) Express $f(x) = 7 - 4x - x^2$ in the form $f(x) = a + (x + b)^2$.
(b) Sketch the graph of $f(x)$ showing clearly its turning point and where it crosses the y-axis.

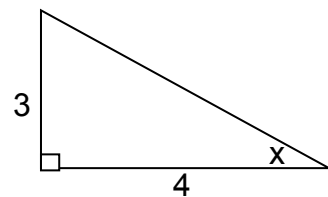
- (a) Find the equation of the tangent to the circle $x^2 + y^2 - 18y + 64 = 0$ at the point $A(4, 8)$.

- (b) Show that this tangent is also a tangent to the parabola $y = x^2 - 6x + 17$ and find the point of contact.



- Given $\tan x = \frac{3}{4}$, find the exact value of

- $\cos 2x$
- $\cos 4x$

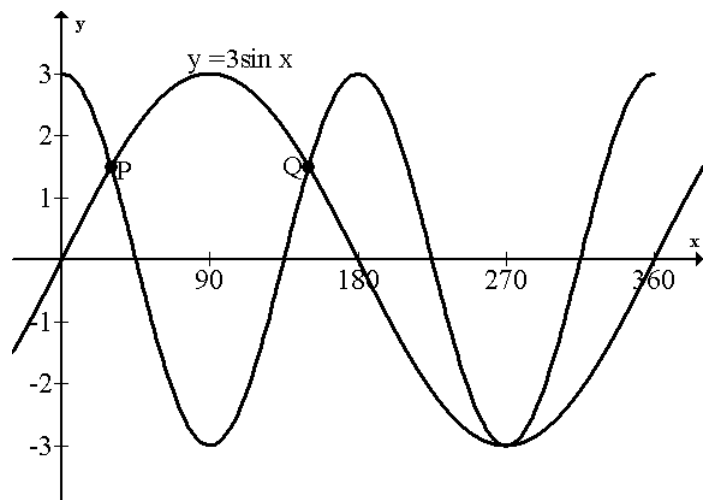


- Show that the roots of the equation $mx^2 + (m - 2)x - (m + 1) = 0$ are real for all values of m .
- Find the equation of the tangent to the curve $y = \frac{1}{2}x^4 - 15x + 20$ which makes an angle of 45° with the positive direction of the x-axis.

Calculator section:

- The diagram opposite shows the graphs of $y = a \cos bx$ and $y = 3 \sin x$.

- Write down the values of a and b .
- Find the coordinates of P and Q.



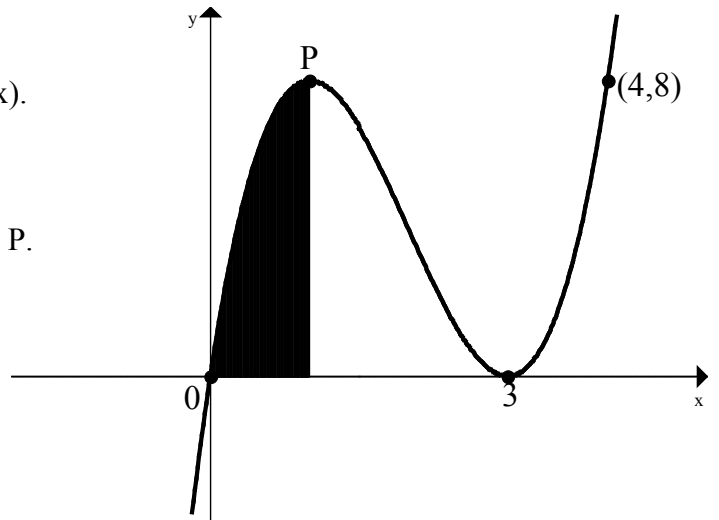
9. Given $\frac{dy}{dx} = 4x + 6\sqrt{x}$ and $y = 50$ when $x = 4$, find a formula for y .

10. A recurrence relation is defined as $u_n = 0.85u_{n-1} + 30$, $u_0 = 40$.

- (a) Find the smallest value of n such that $u_n > 110$.
- (b) Find the limit of this recurrence relation, stating why a limit exists.

11. The diagram opposite shows the graph of $f(x)$.

- (a) Find a formula for $f(x)$.
- (b) Find the coordinates of the turning point P .
- (c) Calculate the shaded area.



12. Part of the graph of $y = 2\sin x + 5\cos x$ is shown in the diagram.

- (a) Express $2\sin x + 5\cos x$ in the form $k\sin(x + a)^\circ$ where $k > 0$ and $0 \leq a \leq 360$.
- (b) Find the coordinates of the minimum turning point P .

