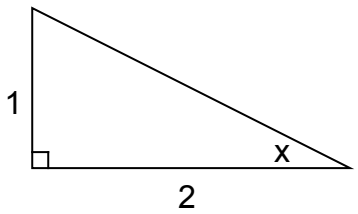
Higher Maths – Homework 7

1. Given that x is an acute angle and $\tan x = \frac{1}{2}$, cos 2x will be equal to



A $\frac{3}{5}$ B $-\frac{3}{5}$ C $\frac{3}{\sqrt{5}}$ D $-\frac{3}{\sqrt{5}}$

2. What is the integral of $(6x - 1)^2$ with respect to x?

A $12x^3 - 6x^2 + x + c$ B $3x^2 - x + c$ C $72x - 12 + c$ D $36x^2 - 12x + 1 + c$

3. $x^3 - 3x^2 + 4$ has two factors. One is $(x - 2)$, the other is

A $(x - 1)$ B $(x + 1)$ C $(x + 2)$ D $(x - 4)$

4. A recurrence relation is defined as $u_{n+1} = 0.8u_n + 10$, $u_o = 12$.

(a) Find the smallest value of n for which $u_n > 35$.
(b) Explain why this relation has a limit and calculate this limit.

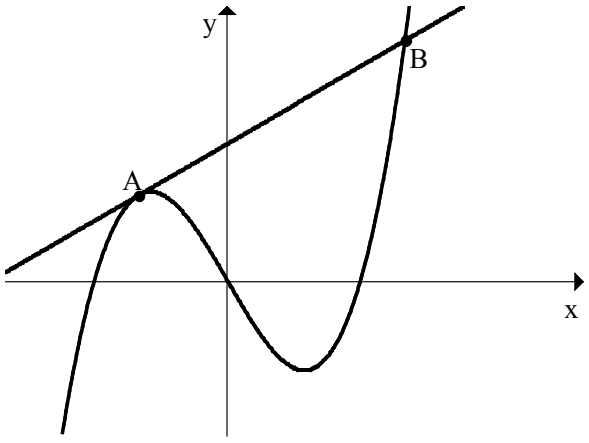
5. Solve the equation $\sin 2x + \sin x = 0$ for $0 \leq x \leq 360$.

6. (a) Express $f(x) = 2x^2 + 8x - 5$ in the form $f(x) = a(x + b)^2 + c$.
(b) Hence, or otherwise, sketch $y = 2 - f(x)$, showing clearly the turning point and the point of crossing the y-axis.

7. Given $x^2 + (k- 4)x + k^2 + k - 5 = 0$ has equal roots, find two values for k.

8. In the diagram opposite AB is a tangent to the curve $y = x^3 - 9x$ at the point where $x = -2$.

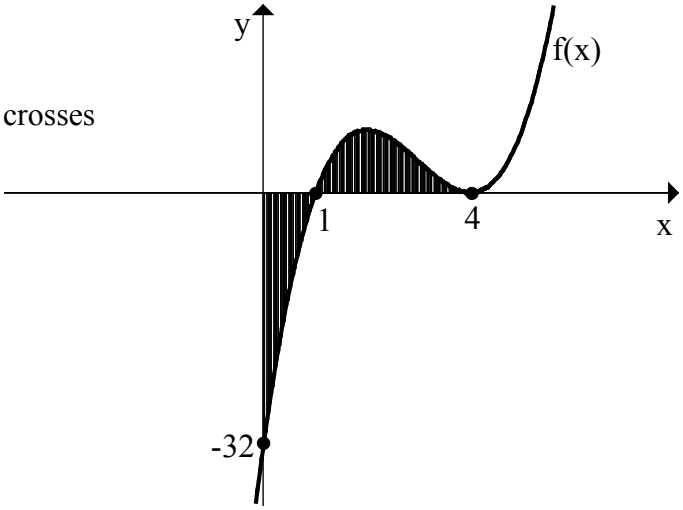
(a) Find the equation of this tangent.
(b) Find the coordinates of B where the tangent meets the curve again



9. A is the point (-3,5), B is (1,-3) and C is (8,5).
   (a) Find the equation of the perpendicular bisector of AB.
   (b) Find the coordinates of the point where this perpendicular bisector meets the line AC

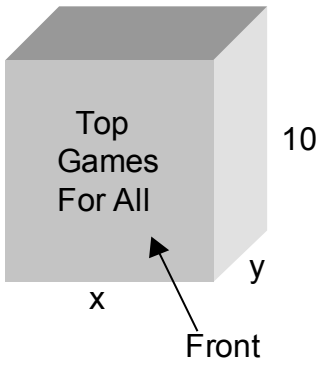
10. In the diagram f(x) has roots at 1 and 4, and crosses the y-axis at (0,-32).

   (a) Find a formula for f(x).
   (b) Hence calculate the shaded area.



11. $f(x) = x^3 + 3x^2 + ax + 5$ has only one stationary point.
Find the value of a and determine the nature of this stationary point.

12. The cuboid shown is being used by a games company for promotion.
Its volume is 1000 cm^3.



The faces of the cuboid are to be painted in different colours. The cost of painting is as follows.

Faces	
Front and back faces	10p per cm^2
Left and right faces	40p per cm^2
Top and bottom faces	20p per cm^2

(a) Show that the total cost in **pounds**, C, of painting is given by

$$C = 40 + 2x + \frac{800}{x}.$$

(b) Find the minimum cost of painting the faces.