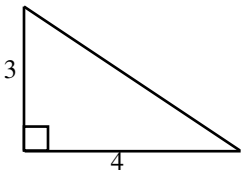**= Year 12**   **= Calculus**   **= Worksheet 6**
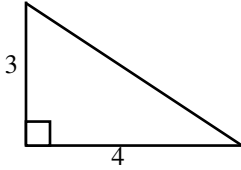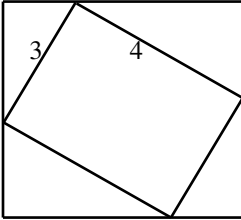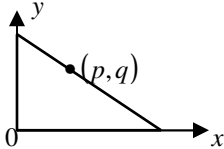
1. Water flows out of a tank at a rate of $r(t) = 2(t+1)(t-5)^2$ litres per minute at time $t \geq 0$ (min). Find the time when the flow is the quickest.	2. Find the area of the largest *rectangle* that can fit inside the following triangle.
3. Find the area of the largest *square* that can fit inside the following triangle. 	4. Find the radius of a 1-litre cylindrical can, which will minimise the cost of the metal to make it.
5. Find the point on the line $2x + y = 10$ that is closest to the point $(6,3)$.	6. A right circular cylinder is placed inside a sphere of radius 5 cm. Find the largest possible volume of the cylinder.
7. A right circular cylinder is placed inside a sphere of radius 5 cm. Find the largest possible surface area of the cylinder.	8. At what production level will the average cost per television be lowest if the cost (\$) of producing x televisions each week is $C(x) = 260 + 0.2x + 0.001x^2$?
9. The volume (kL) of water in a pond at day t is given by $V(t) = \dfrac{2\log_e\left(\dfrac{t}{2}\right)}{t}$, where $t \geq 1$. Find the maximum volume of water in the pond.	10. Find the area of the largest rectangle that has each of its sides touching a vertex of the given rectangle (4 cm by 3 cm).
11. In terms of p and q, where $p,q > 0$, find the area of the smallest right-angle triangle with the point (p,q) lying on its hypotenuse. 	Numerical, algebraic and worded answers. 1. 1 min 2. 3 square units 3. 144/49 square units 4. $(500/\pi)^{1/3}$ cm 5. $(4,2)$ 6. $500(\sqrt{3})\pi/9$ cm^3 7. $25(1+\sqrt{5})\pi$ cm^2 8. 510 9. $1/e$ kL 10. 49/2 cm^2 11. $2pq$ square units