2. A spherical ball of ice with radius r cm is melting.

The volume of the ball of ice, $V\,\text{cm}^3$, is decreasing at a constant rate, $k\,\text{cm}^3$ per second, where k is a constant.

Given that $V = \frac{4}{3}\pi r^3$, show that the rate of decrease of the radius of the ball of ice with respect to time is inversely proportional to the square of the radius.

(4)

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Question 2 continued

(Total for Question 2 is 4 marks)

3. Given that $y = 4$ at $x = \frac{\pi}{6}$, solve the differential equation

$$y\cos^2(2x)\frac{dy}{dx} = 3\sin(2x) \qquad y > 0 \qquad -\frac{\pi}{4} < x < \frac{\pi}{4}$$

giving your answer in the form $y^2 = g(x)$

(6)

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