**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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**Question 3 continued**

**(Total for Question 3 is 6 marks)**

**4.** **In this question you must show all stages of your working.**
**Solutions relying entirely on calculator technology are not acceptable.**

$$f(x) = \frac{5 + 17x - 10x^2}{x(1 - x)(2x + 1)} \qquad x > 1$$

(a) Write $f(x)$ in the form

$$\frac{A}{x} + \frac{B}{1 - x} + \frac{C}{2x + 1}$$

where $A$, $B$ and $C$ are constants to be found.

**(3)**

(b) Hence, use algebraic integration to find the exact value of

$$\int_2^4 f(x)\,dx$$

Write your answer in the form $p \ln 2 + q \ln\left(\frac{3}{5}\right)$, where $p$ and $q$ are integers to be found.

**(5)**

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