Topic assessment

1. Find the mean value of the function $f(x) = x^3$
   (i) over the interval [0, 2] [3]
   (ii) over the interval [-2, 2] [2]
   Explain your answer to (ii) with the aid of a sketch graph. [2]

2. Find, in exact form, the mean values of the following functions over the given intervals.
   (i) $f(x) = \dfrac{1}{4+3x^2}$ over the interval [0,2] [5]
   (ii) $f(x) = \dfrac{1}{\sqrt{16x^2+9}}$ over the interval [0,1] [5]

3. A curve has parametric equations $x = 1 - \cos 2\theta, y = \cos\theta$ for $0 \le \theta \le \frac{\pi}{2}$.
   Find the volume of the solid generated when the curve is rotated through 360° about the x-axis. [6]

4. A curve has equation $y = \dfrac{5}{\sqrt{9+x^2}}$.
   (i) Find, in exact form, the area of the region enclosed by the curve, the coordinate axes and the line $x = 4$. [5]
   (ii) The region in (i) is rotated through 360° about the x-axis. Find the volume of the solid generated. Give your answer to 3 s.f. [4]

Total 32 marks