BRONZE.

The region bounded by the curve with equation $y = 3 + \sqrt{x}$, the x-axis and the lines $x = 1$ and $x = 4$ is rotated through 2π radians about the x-axis.

Use integration to show that the volume generated is $\frac{125\pi}{2}$

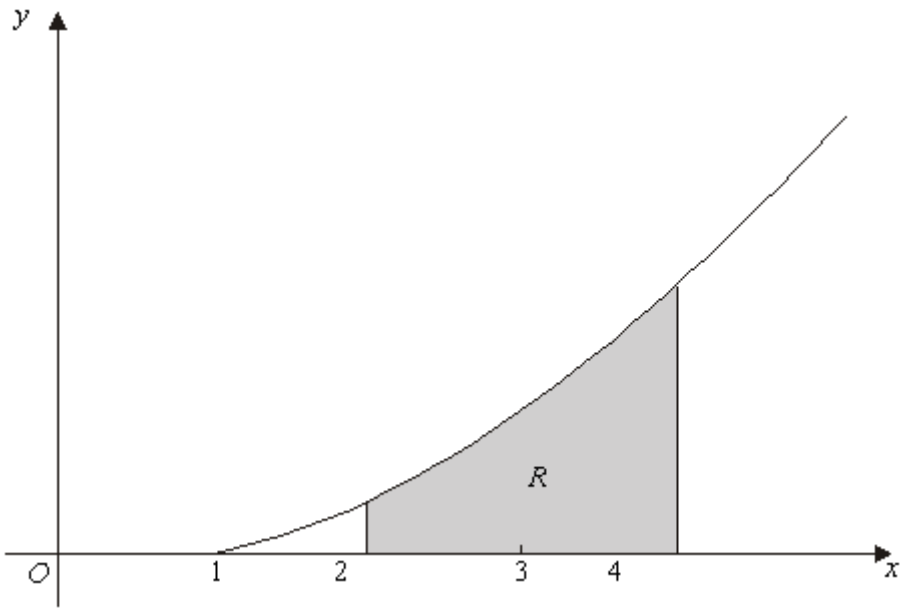
(Total 5 marks)

SILVER.

(a) Differentiate $(x - 1)^4$ with respect to x.

(1)

(b) The diagram shows the curve with equation $y = 2\sqrt{(x-1)^3}$ for $x \geq 1$.



The shaded region R is bounded by the curve $y = 2\sqrt{(x-1)^3}$, the lines $x = 2$ and $x = 4$, and the x-axis.

Find the exact value of the volume of the solid formed when the region R is rotated through 360° about the x-axis.

(4)

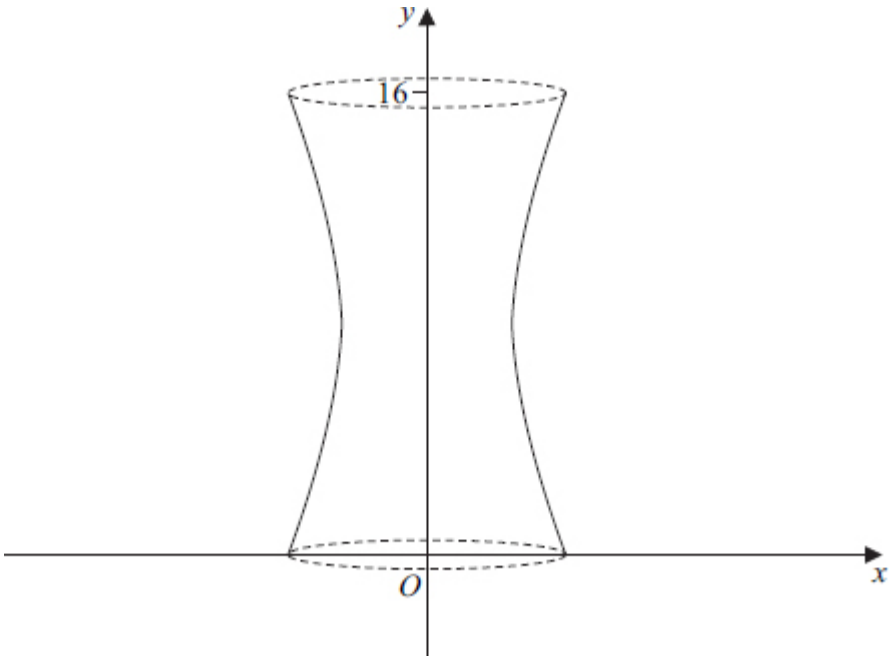
(c) Describe a sequence of **two** geometrical transformations that maps the graph of $y = \sqrt{x^3}$ onto the graph of $y = 2\sqrt{(x-1)^3}$

(4)

(Total 9 marks)

GOLD.

The shape of a vase can be modelled by rotating the curve with equation $16x^2 - (y - 8)^2 = 32$ between $y = 0$ and $y = 16$ completely **about the y-axis**.



The vase has a base.

Find the volume of water needed to fill the vase, giving your answer as an exact value.

(Total 5 marks)

[5]