**2015  16**
**b**
A bowl is formed by rotating the curve $y = 8 \log_e(x - 1)$
about the *y*-axis for $0 \le y \le 6$.

**3**

Find the volume of the bowl.
Give your answer correct to 1 decimal place.

Not to scale
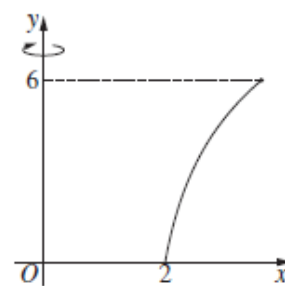
$y = 8 \log_e(x - 1)$

$$\frac{y}{8} = \log_e(x - 1)$$

$$x - 1 = e^{\frac{y}{8}}$$

$$x = e^{\frac{y}{8}} + 1$$

$$x^2 = (e^{\frac{y}{8}} + 1)^2$$

$$= e^{\frac{y}{4}} + 2e^{\frac{y}{8}} + 1$$

$$V = \pi \int_0^6 x^2 \, dy$$

$$= \pi \int_0^6 \left( e^{\frac{y}{4}} + 2e^{\frac{y}{8}} + 1 \right) dy$$

$$= \pi \left[ 4e^{\frac{y}{4}} + 16e^{\frac{y}{8}} + y \right]_0^6$$

$$= \pi \left( 4e^{1.5} + 16e^{0.75} + 6 - (4e^0 + 16e^0 + 0) \right)$$

$$= 118.7482959\ldots$$

$$= 118.7 \text{ (1 dec pl)}$$

$\therefore$ the volume is 118.7 units$^3$.

State Mean:
**1.14**

**Board of Studies: Notes from the Marking Centre**

Available in April/May 2016.