Year 2 **Pure Mathematics Examination Revision : Health Check N° 7**

Kill or Cure ?

Any solution based entirely on graphical or numerical methods is not acceptable

Marks Available : 30

Question 1

Simplify $\dfrac{x^2 + 4x + 4}{y^2 - 6y + 9} \div \dfrac{x^2 - 4}{y^2 - 9}$

[4 marks]

Question 2

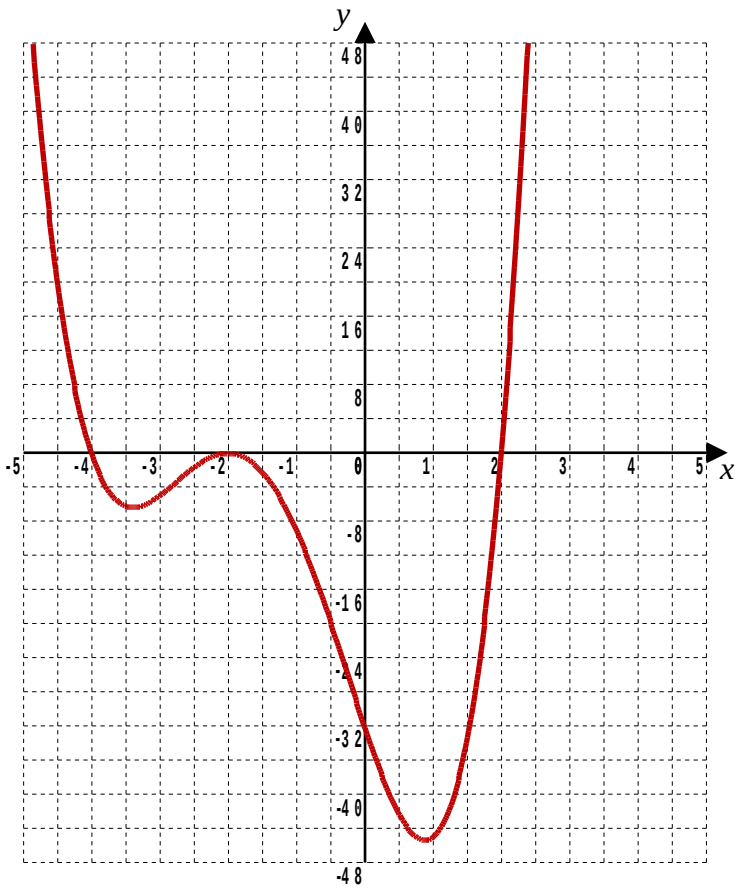
Find the exact value of

$$\sum_{r=3}^{7} 3\left(-\frac{1}{2}\right)^r$$

[4 marks]

Question 3

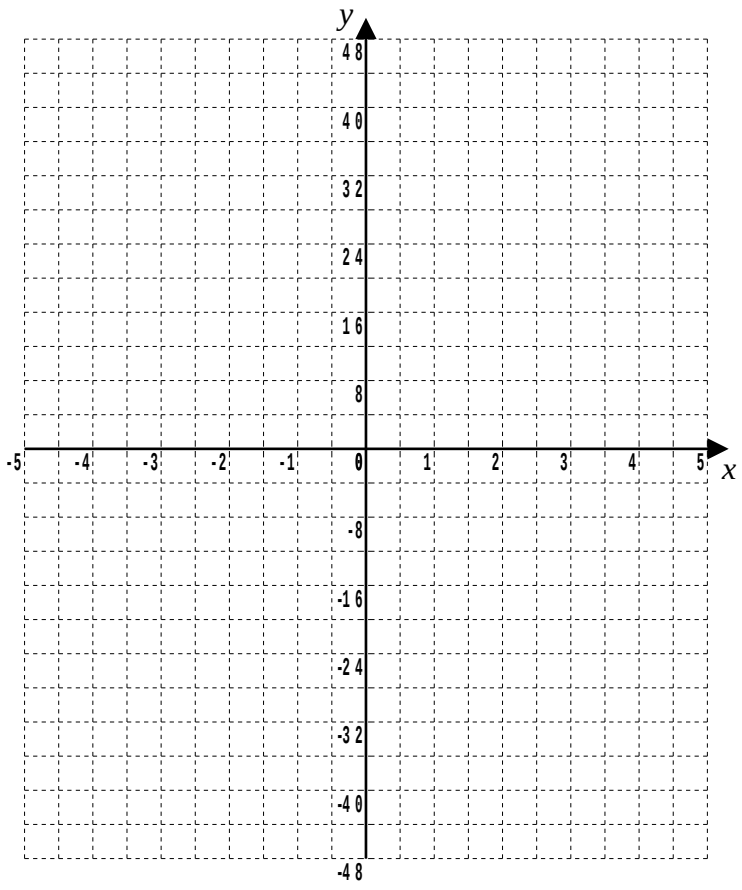
The diagram shows a sketch of part of the curve with equation $y = g(x)$, $x \in \mathbb{R}$



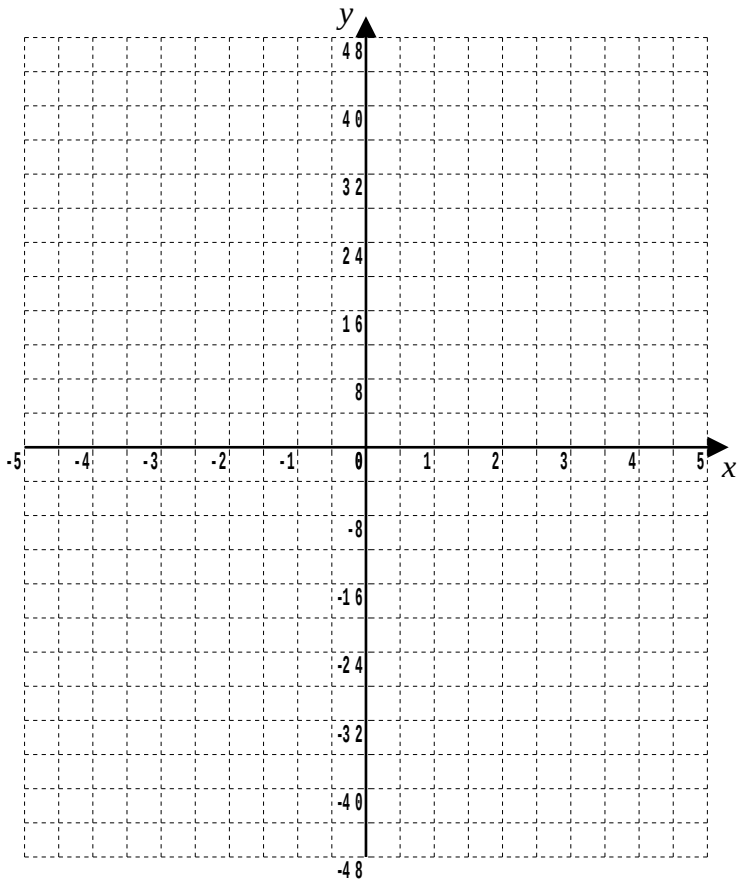
On separate diagrams sketch the curves with equations,

(i) $y = |g(x)|$

(ii) $y = g(|x|)$



[3 marks]

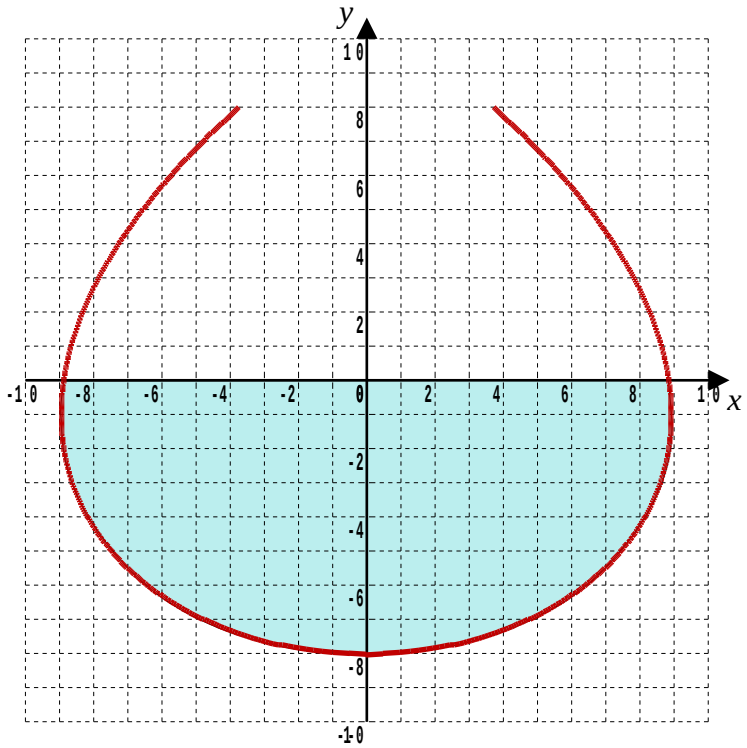


[3 marks]

Question 4

The cross-section of a vase design is given by the parametric equations

$$x = (18t - 32\sin t) \text{ cm}, \quad y = (8 - 16\cos t) \text{ cm} \quad -\frac{\pi}{2} \leqslant t \leqslant \frac{\pi}{2}$$



(i) Find, to three significant figures the width of the opening of the vase

[4 marks]

(ii) The vase is filled with water up to the level of the x-axis.
Find the radius of the vase at the surface of the water.

[3 marks]

Question 5

$$f(x) = x^2(2 - 5x)^5$$

(i) Where does the graph of $f(x)$ cross the x-axis ?

[2 marks]

(ii) Use the product rule to obtain an expression for $f'(x)$

[3 marks]

(iii) Show that the gradient is zero at each of the x-axis crossing points of part (i) and, for each of those points deduce if it is a local minimum, a local maximum, or a point of inflection.

[4 marks]