Version (a)

Let \( r = 2 + 2 \cos \theta \). Find

(i) Arc length of this curve

(ii) Points on the graph of this curve where the tangent line is horizontal.

Version (b)

Draw the graph of \( r = 5 \cos 3\theta \)
(Show the complete procedure)
Is this graph symmetric about the \( y \)-axis?

Version (c)

Let \( r = 1 - \cos \theta \)
Identify on the graph of this curve:

(i) the highest and lowest point.

(ii) points at which tangent line is vertical.

Version (d)

Find the area of surface generated by revolving the curve
\( x = 4\sqrt{t}, y = \frac{t^2}{2} + \frac{1}{t} (1 \leq t \leq 4) \)
about the \( y \)-axis.

Version (e)

Identify the sketch the polar curve \( r = 6 \sin^2 \left( \frac{\theta}{2} \right) \).
(Hint: Use a double angle formula)