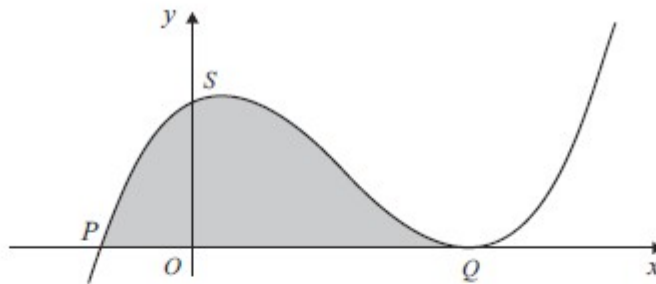6.

Figure 1

Figure 1 shows a sketch of the curve with equation $y = (x + a)(x - b)^2$, where a and b are positive constants. The curve cuts the x-axis at P and has a maximum point at S and a minimum point at Q.

(a) Write down the coordinates of P and Q in terms of a and b.

(2)

(b) Show that G, the area of the shaded region between the curve PSQ and the x-axis, is given

by $G = \dfrac{(a+b)^4}{12}$.

(6)

The rectangle $PQRST$ has RST parallel to QP and both PT and QR are parallel to the y-axis.

(c) Show that $\dfrac{G}{\text{Area of } PQRST} = k$, where k is a constant independent of a and b and find the value of k.

(8)