

1. Let $f(x) = (x + 1000)^2$. Find the exact value of $f'(9)$.

2. Let r denote a positive constant with $r < 57$. Let C denote the circle centred at $(57, r)$ with radius r . It is known that C is tangent to the parabola $y = x^2 + r$ from the outside in the first quadrant. Find the value of r . Give your answer correct to two decimal places.

3. Let a and b denote two positive constants. If

$$\lim_{x \rightarrow 0} \left(\frac{\int_0^x \frac{t^2}{\sqrt{a+2t^5}} dt}{bx - e \sin x} \right) = \frac{1}{\pi},$$

find the value of a . Give your answer correct to two decimal places.

4. Find the total area of the finite domains bounded between the curve $y = x^3 - 4x$ and the line $x + 2y = 2$. Give your answer correct to two decimal places.