

Question 7

(40 marks)

- (a) (i) Air is pumped into a spherical exercise ball at the rate of 250 cm^3 per second.
Find the rate at which the radius is increasing when the radius of the ball is 20 cm.
Give your answer in terms of π .

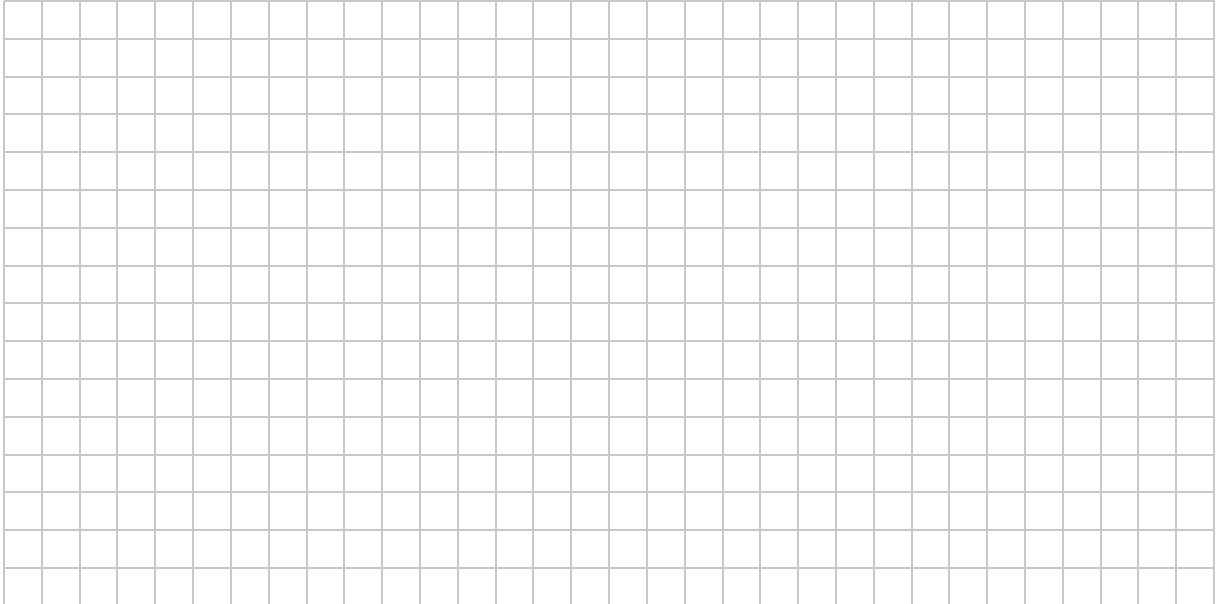
- (ii) Find the rate at which the surface area of the ball is increasing when the radius of the ball is 20 cm.

- (b) The inflated ball is kicked into the air from a point O on the ground. Taking O as the origin, $(x, f(x))$ approximately describes the path followed by the ball in the air, where

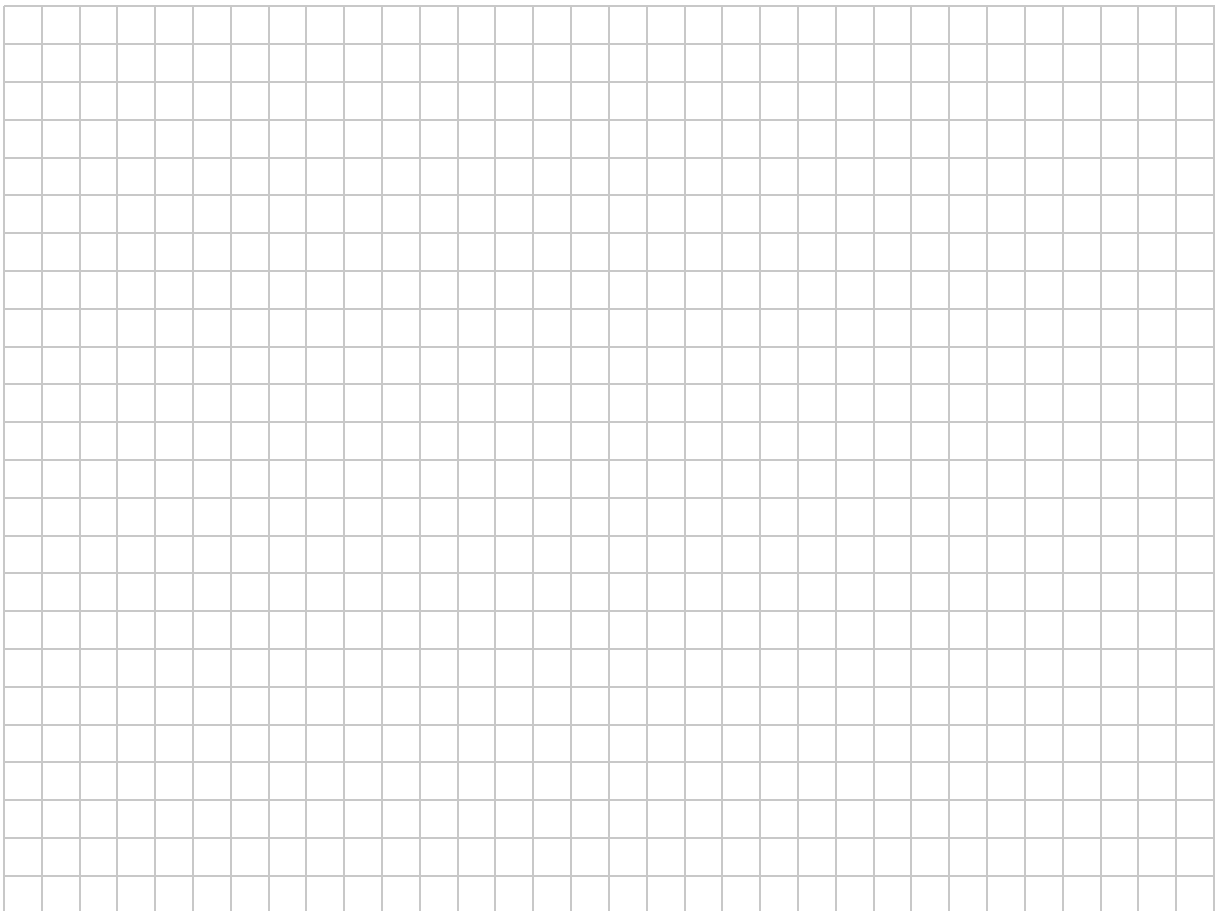
$$f(x) = -x^2 + 10x$$

and both x and $f(x)$ are measured in metres.

- (i) Find the values of x when the ball is on the ground.



- (ii) Find the average height of the ball above the ground, during the interval from when it is kicked until it hits the ground again.



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