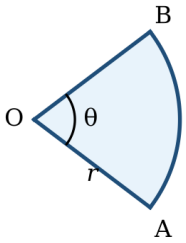
Day 307 **A Level Maths: B Tier 10-a-day**

1 Given that $y = \frac{1}{(x^2 + 3)}$,

find $\frac{dy}{dx}$, and the gradient of the curve when $x = 0$.

2 $X \sim B(10, 0.7)$. Find, to 3 significant figures,
(a) $P(4 \leq X \leq 7)$
(b) $P(X \geq 7)$

3 The diagram shows a sector OAB of a circle with centre O, radius 8 cm and angle 1.3 radians.
Find (a) the arc length AB, (b) the area of the sector.



4 $f(x) = 2x + 1$ and $g(x) = x^2 - 6$ for $x \in \mathbb{R}$.
(a) Find $fg(x)$.
(b) Solve $gf(x) = -5$.

5 A ball is kicked from horizontal ground with speed 63.7 m s^{-1} at an angle θ above the horizontal, where $\tan\theta = \frac{5}{12}$.

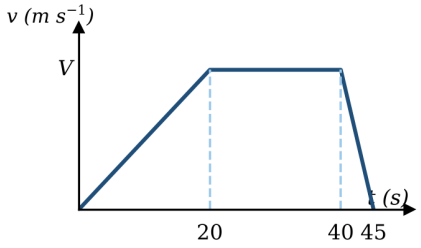
Take $g = 9.8$ m s^{-2}.
Find (a) the time of flight, (b) the horizontal range.

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6 The probability that a student passes a driving test first time is thought to be 0.5. In a sample of 25 students, 6 pass first time.
Test, at the 5% significance level, whether the probability is different from 0.5.

7 The curve C has equation $y = x^2 - x + 5$.
C is stretched by scale factor 2 parallel to the y-axis.
Find its new equation.

8 A lift travels between floors in 45 s. The speed-time graph is a trapezium, with the maximum speed V m s^{-1} held from t = 20 to t = 40.
The floors are 195 m apart. Find V, and the deceleration in the final stage.



9 The function $f(x) = \ln x + x - 5$.
Show that f(x) = 0 has a root between x = 3.5 and x = 4.

10 The line l has equation $y = -\frac{3}{2}x + 12$. The point P is (7, 8).
(a) Find the line through P perpendicular to l, as ax + by + c = 0 with integer a, b, c.
(b) Find the foot F and the exact distance PF.