Day 33	A Level Maths: S Tier 10-a-day
1 Express $\frac{-5x^2 + 32x - 56}{(x-4)(x-2)^2}$ in the form $\frac{A}{(x-4)} + \frac{B}{(x-2)} + \frac{C}{(x-2)^2}$.	
2 A car of mass 1200 kg tows a trailer of mass 400 kg along a horizontal road, with driving force 1120 N. Resistances are 400 N on the car and 240 N on the trailer. (a) Find the tension in the tow bar. At 4.8 m s^{-1} the tow bar breaks. (b) Find the distance between car and trailer when the trailer stops.	
3 A data set has lower quartile 16 and upper quartile 23. An outlier is a value more than 1.5 × IQR beyond the nearest quartile. (a) Find the range of values that are not outliers. (b) 8 observations have mean 17. The largest is 38, an outlier, and it is removed. Find the new mean.	
4 $f(x) = x^3 + x - 15$. (a) Show that $f(x) = 0$ has a root α with $2 < \alpha < 3$. (b) Use Newton-Raphson with $x_0 = 2$ to find x_1 and x_2 to 4 decimal places.	
5 $P(X = x) = kx^2$ for x = 1, 2, ..., 4, and 0 otherwise. (a) Show that $k = \frac{1}{30}$. (b) Find E(X) and Var(X). (c) Find Var(4X + 4).	

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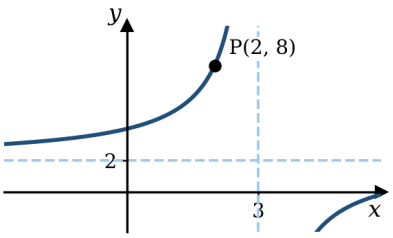
6 Find the exact coordinates of the stationary point of

$y = \frac{e^x}{x^3}$ for $x > 0$,

and determine its nature.

7 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation

$y = \frac{a}{x + p} + q$. Find a, p and q.



8 One root of $x^2 + kx + 27 = 0$ is the square of the other root. Find the possible values of k.

9 A river is 60 m wide and flows at 15 m s^{-1}. A boatman can row at 17 m s^{-1} in still water and wants to reach the point directly opposite his starting point.
Find (a) the angle to the bank at which he should head, to 1 d.p., (b) the time taken, to 3 s.f.

10 $f(\theta) = \frac{3}{31 + 7 \sin \theta + 24 \cos \theta}$

(a) Write $7 \sin \theta + 24 \cos \theta$ as $R \sin(\theta + \alpha)$, $R > 0$, $0 < \alpha < 90°$.
(b) Find the greatest and least values of $f(\theta)$, and the smallest positive θ at which the greatest value occurs, to 1 d.p.