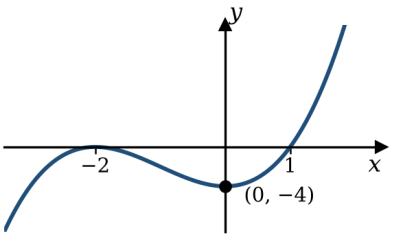
Day 272	A Level Maths: S Tier 10-a-day
1 $f(x) = \frac{6}{x^2 - 6x + 12}$ for all real x. Find the greatest value of f(x), the value of x at which it occurs, and the range of f.	
2 A uniform plank AB of length 8 m and mass 30 kg rests on supports at C and D, where AC = 2 m and DB = 3 m. A girl of mass 60 kg stands on it at distance x m from A. Find the range of x for which the plank stays in equilibrium on both supports.	
3 Solve $e^x + 15\,e^{-x} = 8$, giving your answers exactly in terms of natural logarithms.	
4 A(1, −5) and B(−3, 3). The point C lies on the x-axis and CA = CB. Find the coordinates of C and the area of triangle ABC.	
5 Find the exact value of $\sin(\sin^{-1}(\frac{5}{13}) + \cos^{-1}(\frac{3}{5}))$.	

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6 The diagram shows the cubic y = f(x), which touches the x-axis once. Find f(x), giving your answer in expanded form. 	
7 Car P passes a point O travelling at a constant speed of 14.7 m s^{-1}. 6 s later, car Q leaves O from rest with constant acceleration 3 m s^{-2}, travelling in the same direction. Q overtakes P at the point X. Find (a) the time Q takes to reach X, (b) the distance OX, (c) the speed of Q at X.	
8 Emails arrive in an inbox at an average rate of 4 per hour, independently and at random. (a) Find the probability of at least 2 in a 20-minute period. (b) Find the probability that, of 7 separate 20-minute periods, exactly 3 have no arrivals.	
9 The curve C has equation $x^2 + 3xy + 4y^2 = 63$. Find the coordinates of the points on C where the tangent is parallel to the x-axis.	
10 A test of H_0: p = 0.25 against H_1: p < 0.25 uses a sample of 30 at the 10% level. (a) Find the critical region for X, the number of successes. (b) Find the actual significance level. (c) Find P(Type II error) when in fact p = 0.05.	