Math SL PROBLEM SET 90

1. **(SP5.6 - R) (CI)** The events A and B are such that P(A) = 0.3, P(B) = 0.5 and P(A ∪ B) = 0.55. Find the probability of: **(Cirrito 15.2, p510)**

   a. A|B b. B|A c. A|B`  d. A`|B`

2. **(A1.3 - R) (CA)** The position vectors of the points A, B and C are given by OA = $\boldsymbol{i} + 2\boldsymbol{j} + 2\boldsymbol{k}$, OB = $\boldsymbol{i} + a\boldsymbol{j} - 2\boldsymbol{k}$ and OC = $b\boldsymbol{i} + 3\boldsymbol{j} + c\boldsymbol{k}$, where a, b and c are constants. Find: **(Cirrito 12.3, p415)**

   a. a if OA is perpendicular to OB
   b. b and c if O, A and C are collinear

3. **(SP5.8 - R) (CA)** When not busy doing test corrections, Yousef is a darts player in his spare time. The probability that he hits the bullseye with one dart is 0.4. **(Cirrito 16.3, p548)**

   a. Find the probability that Yousef hits at most 2 bullseyes with three darts.
   b. If the probability of scoring at least one bullseye with n darts is greater than 0.9, find the least possible value of n.

4. **(CA6.4 - R) (CI)** Evaluate the following integrals. In each case, let the point (1,1) be a point on the original function. **(Oxford 9B, p294)**

   (i) $y = \int \sqrt[5]{x^4}\,dx$ (ii) $y = \int dx$ (iii) $y = \int (3x^2 + \frac{2}{x} + \sqrt{x})\,dx$

   (iv) $y = \int \left(t^2 + \sqrt[4]{t}\right) dt$ (v) $y = \int (e^{4x} + cos(4x))\,dx$ and the point is (0,1)

5. **(C6.6 - N) (CA)** The part of the curve $f(x) = -x^2 - x + 2$ between $x = 1$ and $x = 2$ is rotated around the x-axis. Find the volume of this solid of revolution. **(Cirrito 22.7, p768)**

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6. **(SP5.9 - R) (CA)** A brand of soft drink is sold in "litre" bottles. The amount of liquid in each bottle is a normally distributed random variable with a mean of 1.005 litres and a standard deviation of 0.01 litres. **(Cirrito 17.2, p568)**

   a. Find the proportion of bottles containing less than 1 litre.
   b. If I buy five bottles, find the probability that at least 2 of them contain less than one litre.
   c. For a second brand of soft drink, the probability that the bottle contains at most 995 ml of drink is 0.38974, while the probability that the bottle contains more than 1050 mL is 2.74289%. Find the mean and standard deviation of the amount of liquid in the bottles of the second brand.

7. **(SP5.9 - R) (CA)** The average time it takes high speed trains to travel between Paris and London is 2 hours and 15 minutes with a standard deviation of σ. **(Cirrito 17.2, p557)**

   a. If the probability that the trip takes 2 hours and 10 minutes is 0.1056, show that $\sigma = 4$.
   b. What is the probability that a trip will take more than 2 hours and 17 minutes?
   c. What is the interquartile range of a trip on these fast trains?

8. **(C6.6 - E) (CI)** Jana is on a bus is traveling along a straight road and its velocity-time function for the trip is described by the function $v(t) = 2t(5 - t)$, where t is time in minutes and distance is measured in hundreds of meters.

   (Cirrito 22.6, p764)

   a. The domain of the function is $0 < t < 8$. Sketch a graph of the function.
   b. Find the maximum velocity and at what time the bus attains this velocity.
   c. Evaluate $\int_0^8 v(t)\,dt$ and explain what your answer means.
   d. Determine the total distance travelled by the bus.