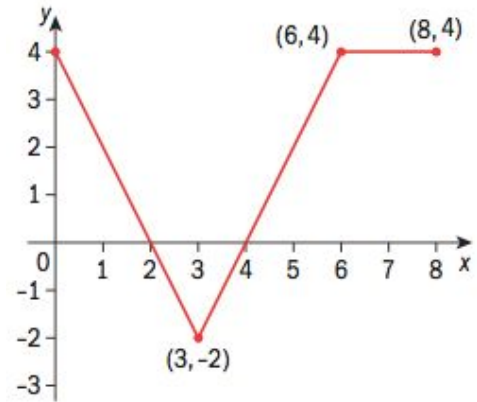


# Math SL PROBLEM SET 70

## Section A (Short Answer)

1. **(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)**

2. **(A1.1 - R) (CA)** The graph of  $f$  consists of line segments as shown. Use the graph to help evaluate the following definite integrals: **(Oxford 9H, p308)**



- a.  $\int_4^8 f(x) dx$
- b.  $\int_0^8 f(x) dx$
- c.  $\int_0^8 (2 + f(x)) dx$
- d.  $\int_0^8 2f(x) dx$
3. **(T3.1, C6.5 - R) (CA)** Given  $f(x) = \sin(x)$  and  $g(x) = \sqrt{3} \cos(x)$ ; **(Cirrito 22.5, p756)**
- Find the values of  $x$  between  $0$  and  $2\pi$  for which  $\sin(x) = \sqrt{3} \cos(x)$ .
  - Sketch, on the same axes, the graphs for  $f$  and  $g$  for values of  $x$  between  $0$  and  $2\pi$
  - Find the area enclosed between the two curves.
4. **(CA6.6 - E) (CA)** The acceleration,  $a$ , in  $\text{ms}^{-2}$  of a particle moving in a straight line is given by  $a(t) = \frac{12}{(t+1)^2}$ . At  $t = 2$  sec, the particle has a velocity of  $4 \text{ ms}^{-1}$ . **(Cirrito 22.6, p762)**
- Find an expression for the velocity of the particle.
  - At what time does the particle change direction?
  - If the particle starts at the origin (i.e.  $s(0) = 0$ ), find the equation for the displacement of the particle.
  - Hence or otherwise, find the
    - total distance travelled in the first 3 seconds,
    - The displacement in the first 3 seconds.
5. **(A1.1 - R) (CA)** Lina and Isabella begin a training program. In the first week, Isabella will run 10 km, in the second week, she will run 11 km and in the third 12 km and so on in an arithmetic progression. Lina will run 5 km in the first week and will increase her distance by 20% in each successive week. **(Cirrito 8.2.3, p262)**
- In what week does Lina's weekly distance first exceed Isabella's?
  - In what week does Lina's total distance first exceed Isabella's?

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6. **(F2.1, F2.6 - R) (CA)** Given that  $P(A) = 0.45$  and  $P(B) = 0.7$  and  $P(A \cap B) = 0.20$ , determine the following: **(Cirrito 15.2, p510)**
- (i)  $P(A \cup B)$       (ii)  $P(A' \cap B')$       (iii)  $P((A \cap B)')$
  - Prepare a Venn diagram given this information about events A and B.
  - Hence, determine (i)  $P(B | A)$       (ii)  $P(B | A')$
  - Are the events A and B independent or dependent?
  - Hence, prepare tree diagram, knowing that A is the first event and B is the second event in your tree diagram. Include ALL probabilities in your diagram.

## Section B (Extended Response/Investigation)

7. **(SP5.9 - N) (CA)**: Over the past 50 years of the ISST track & field event, it was found that the 100m sprint times for JV girls was normally distributed with a mean of 15.6 seconds and a standard deviation of 0.24 s. **(Cirrito 17.2, p568)**
- Find the probability that a JV girl runs the 100m race in:
    - Less than 15 seconds
    - At least 16 seconds
    - Between 15 and 16 seconds
  - In one of the qualifying heats, 8 girls are racing. What is the probability that 6 of them will take between 15 and 16 seconds to finish the race?
  - However, the past 10 years, it has been noted that the probability of a JV girl running more than 16 seconds is 0.00621 and also that  $P(X < 15) = 0.2023$ . Find the mean and standard deviation of the 100m sprint times over these past 10 years.
8. **(CA6.5 - E) (CI)** Points A, B, and C have position vectors  $4\mathbf{i} + 2\mathbf{j}$ ,  $\mathbf{i} - 3\mathbf{j}$  and  $-5\mathbf{i} - 5\mathbf{j}$ . Let D be a point on the  $x$ -axis such that ABCD forms a parallelogram. **(Cirrito 12.7, p444)**
- Find vector BC.
  - Find the position vector of point D.
  - Find the angle between vector BD and vector AC .

The line  $L_1$  passes through A and is parallel to  $\mathbf{i} + 4\mathbf{j}$ . The line  $L_2$  passes through B and is parallel to  $2\mathbf{i} + 7\mathbf{j}$ . A vector equation of  $L_1$  is  $\mathbf{r} = (4\mathbf{i} + 2\mathbf{j}) + s(\mathbf{i} + 4\mathbf{j})$ .

- Write down a vector equation of  $L_2$  in the form  $\mathbf{r} = \mathbf{b} + t\mathbf{q}$ .
- The lines  $L_1$  and  $L_2$  intersect at the point P. Find the position vector of P.