Math SL PROBLEM SET 60

1. **(CA)** Given the expression $(2x + 1)^5$.
   a. Find the derivative of $(2x + 1)^5$.
   b. Find the term in x^2 in the expansion of $(2x + 1)^5$.
   c. Hence, find the term in x^3 in the expansion of $(x + 3)(2x + 1)^5$.

2. **(CI)** Given the following graph of $f(x)$.
   a. Write down the value of: (i) $f(1)$;   (ii) $f^{-1}(-2)$
   b. Find $(f \circ f)(1)$.
   c. Sketch the graph of $y = 2f(-\frac{1}{2}x + 1)$ on the grid.
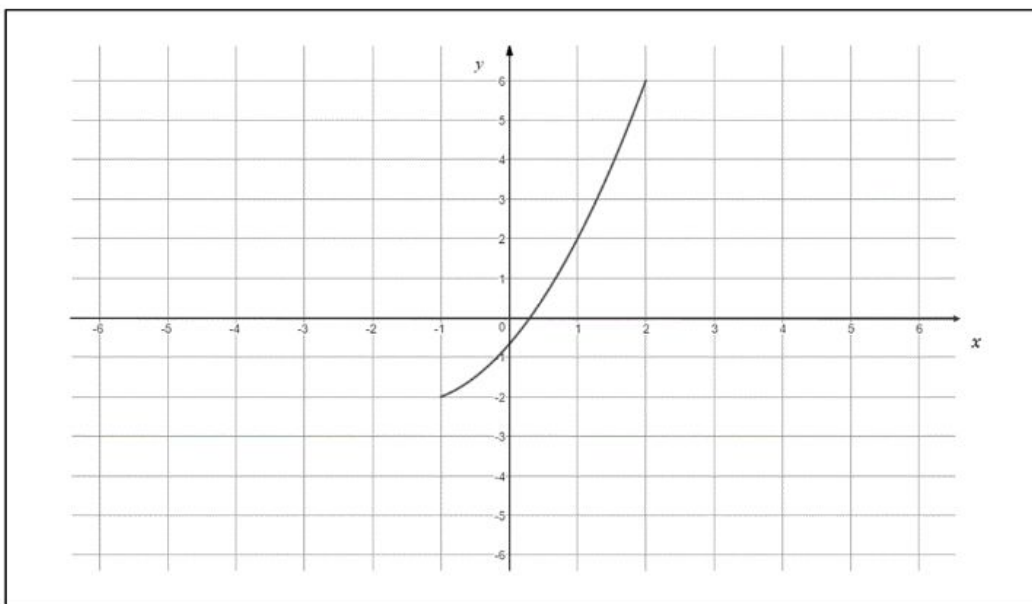
3. **(CA)** Let $u = 6i - 2j - k$ and let $v = 3i + 5j + 3k$. Find:
   a. $-2u + v$;
   b. a unit vector in the direction of v ;
   c. the angle between u and v.

4. **(CA)** Consider the following frequency table:
   a. Write down the mode
   b. Find the range of values.
   c. Find the mean
   d. Find the variance.
   e. Prepare a sketch of relative frequency polygon.

| x	Frequency
1	12
3	20
6	26
9	32
11	5

5. **(CA)** Estelle conducts research for her EE into how many minutes each day IB year 1 students spend browsing the internet. The number of minutes spent browsing the internet by each student is shown in the following stem and leaf plot.

Stem	Leaf	Key: 2|3 represents 23 minutes
1	0, 4, 8	
2	3, 5, 8, 9	
3	1, 3, 3, 6, 6, 8	
4	0, 4, 5	

    a. Write down the number of students in Estelle's research.

    b. Find the median number of minutes spent browsing the internet.

The following box-and-whisker plot also displays the number of minutes spent browsing the internet by the IB year 1 students in Estelle's research.
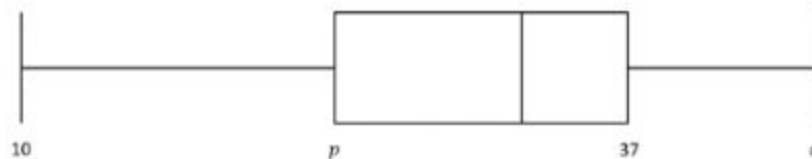
    c. Write down the value of q.

    d. The interquartile range is 13. Find the value of p.

    e. Use the IQR to determine the values of minutes spent that would be rejected as outliers

6. **(CI)** A particle travels with a velocity of v ms^{-1} for 9 seconds. This is shown in the graph.

    a. Write down the car's velocity at $t = 4$.

    b. Find the car's acceleration at $t = 2$.

    c. Find the total distance travelled.
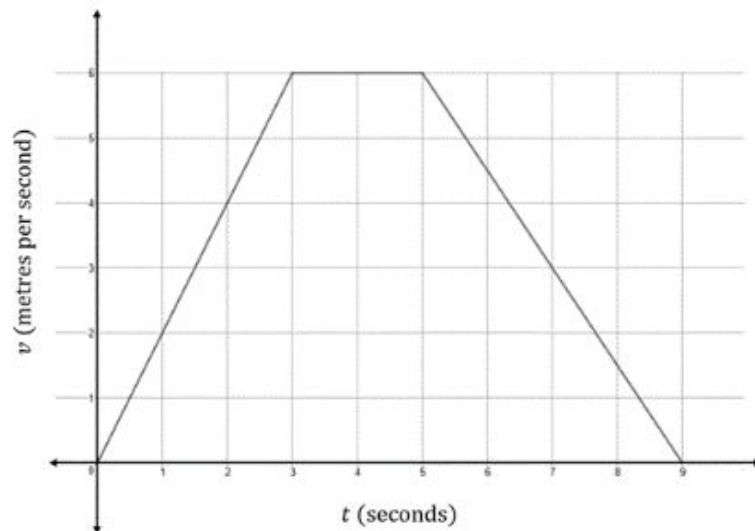
7. (CA) A particle moves in a straight line path with velocity $v = 2t - 0.3t^3 + 2$, for $t \geq 0$, where v is in ms^{-1} and t is in seconds.

    a. Find the acceleration of the particle after 2.2 seconds.

    b. Find the time when the acceleration is zero.

    c. Find the velocity with the acceleration is zero.

    d. Find the position of the particle, $s(t)$, at any time t, given that $s(1) = 1.3$

8. **(CA)** Ayla can randomly select one chocolate from a large box full of chocolates of different types and sizes.

> The probability that a chocolate is sugar free is 0.6
> The probability that a chocolate is king size is 0.25
> The probability that a chocolate is sugar free or a king size is 0.8

Find the probability that a chocolate chosen by Ayla is not a sugar free king size.

9. **(CI)** The Venn diagram shows the events A and B, where $P(A) = 0.3$ and $P(A \cap B) = 0.2$ and $P(A \cup B) = 0.7$. The values of p, q, r, s are probabilities.

    a. Write down the value of r.
    b. Find the values of p, q, and s.
    c. Draw a tree diagram for this problem.
    d. Determine $P(A \mid B`)$
    e. Are the events dependent or independent?
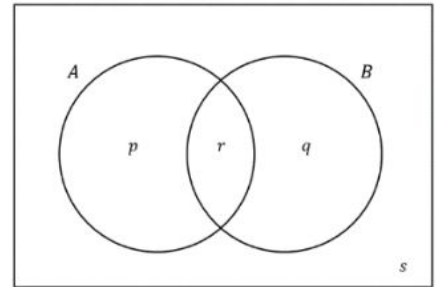
10. (CI) Let $f(x) = \frac{3x-6}{x+1}, x \neq -1$.

    a. Find the x- and y-intercepts as well as the equations of the asymptotes and graph $y = f(x)$.
    b. Determine the equation for $y = f^{-1}(x)$.

11. (CA) Consider the points A(3,2,-5) and B(-3,6,-5).

    a. Find vector AB.

Let C be a point such that vector AC $= 3\mathbf{i} + 2\mathbf{k}$.

    b. Find the coordinates of C.
    c. The line L passes through B and is parallel to vector AC.
    d. Write down a vector equation for L.
    e. Given that $\left|\overrightarrow{AB}\right| = k\left|\overrightarrow{AC}\right|$, find k.
    f. The point D lies on L such that $\left|\overrightarrow{AB}\right| = \left|\overrightarrow{AD}\right|$. Find the possible coordinates for D.