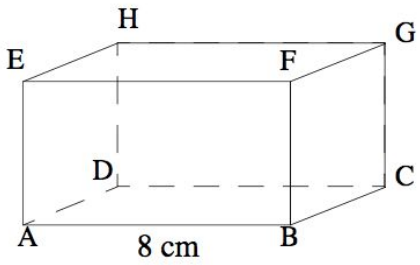
Math SL PROBLEM SET 32

Section A (Short Answer)

1. **(C6.3 - N)** (**CA**) Graph the quartic polynomial $p(x) = -x^4 + 2x^2 - x + 1$ on your TI-84 and hence determine: **(Cirrito 20.2.2, p651)**

   a. the x-coordinate(s) of the extremas.
   b. the domain interval(s) in which the function values are **decreasing**.
   c. the x-coordinates of the inflection point(s).
   d. the domain interval(s) in which the function is **concave up**.
   e. Include a sketch, labelling the important points from (a) and (c).

2. **(T3.6 - R)** (**CA**) The diagram given shows a rectangular box with side lengths AB = 8 cm, BC = 6 cm and CG = 4 cm. Find the angle between **(Cirrito 9.3, p283)**



   a. the line BH and the plane ABCD
   b. the lines BH and BA
   c. the planes ADGF and ABCD

3. **(A1.2 - N)** (**CI**) Given that $\log_2(5) = K$ and $\log_2(6) = M$ and $\log_2(7) = N$, find expressions in any of K, M, and N for the following: **(Oxford, Chap 4N, p124)**

   a. $\log_2(180)$
   b. $\log_2\left(\frac{125}{7}\right)$
   c. $\log_8(1.96)$

4. (**T3.2, T3.3 - N**) (**CI**) The value of the angle x is in the interval $\frac{\pi}{2} < x < \pi$ pi and it is known that $\cos^2(x) = \frac{8}{9}$. Find the exact values of: (HINT:diagram might help …..) **(Oxford 13.1, p448)**

   a. $\sin(x)$ b. $\cos(2x)$ c. $\tan(2x)$

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5. **(T3.5 - N)** (**CI**) For the equation $2\sin^2(x) - \cos(x) + 1 = 0$, use a substitution of an appropriate trigonometric identity to create an equivalent equation (in one trigonometric function) and hence solve the equation on the domain of $0 \leq x \leq 2\pi$. **(Oxford, Chap 13D, p455)**

6. **(F2.7, C6.1 - E)** (**CA**) Determine the value(s) of p such that the line $f(x) = 2x - 1$ is **tangent** to the parabola $g(x) = 2x^2 + (p + 2)x$. Include a diagram, illustrating the relationship between $f(x)$ and $g(x)$. **(Cirrito 2.4.4, p56)**

Section B (Extended Response/Investigation)

7. **(SP5.7 - N)** (**CA**) As a way of introducing the concept of **discrete random variables**, we will revisit relative frequency distributions and basic stats. Mr S. surveyed his SL1 students about their Unit Test studying time and recorded the following results: **(Cirrito 16.1, p527)**

# of hours of studying	frequency	Relative frequency
0	**5**	**0.167**
1	**8**	
2	**12**	
3	**3**	
4	**2**	

   a. Determine the mean and median hours studied.
   b. Determine the variance and standard deviation of the hours studied.
   c. Determine the remaining relative frequencies for each of the hours studied (the first one has been done for you) and hence, draw a relative frequency distribution graph (a bar graph). We will now call this graph a probability distribution. Explain why.

We will now use the letter $\boldsymbol{X}$ and let it represent the **random variable** of the number of hours studied by a randomly selected student from Mr S's SL1 math class.

   d. Explain what $\boldsymbol{X} = 2$ therefore means. What does $\boldsymbol{X} > 2$ mean?
   e. We now incorporate probabilities (or relative frequencies really..) So, explain what the notation $P(\boldsymbol{X} = 0) = 0.167$ means/communicates in the context of this example.

f. Hence, determine the following probabilities:
   i. $P(X = 0 \text{ or } X = 1)$
   ii. $P(X > 2)$
   iii. $P(X = 2 \mid X > 2)$

8. **(V4.1, V4.2 - E,N)** **(CA)** You are working with two vectors. Vector 1 goes through the points A(4,-2) and B(7,10) and Vector 2 goes through the points C(-3,2) and D(-7,7). **(Cirrito 12.7, p444)**

   For the vector through A and B, determine:

   a. The equation of this vector, expressed in parametric form.
   b. The magnitude of the vector between A and B.
   c. Draw an equivalent **position vector** for the direction vector of AB.

   For the vector through C and D, determine:

   d. The equation of this vector, expressed in vector form.
   e. The magnitude of vector between C and D.
   f. Draw an equivalent **position vector** for the direction vector of CD.

   Draw a third vector, connecting the heads of the two position vectors you have just drawn, thereby completing a triangle.

   g. Use appropriate triangle trigonometry to find the angle between the two position vectors and hence, find the angle between the original two lines.