Math SL PROBLEM SET 37

Section A (Short Answer)

1. **(V4.2 - N)** **(CA)** The lines L_1 and L_2 have the following equations: **(Cirrito 12.6.1, p432)**

    $L_1: x = 1 + 4t, y = 5 - 4t, z = -1 + 5t$ $L_2: x = 2 + 8s, y = 4 - 3s, z = 5 + s$

    a. Is the point (-7,13,-16) on L_1?
    b. What is meant by the term "skew lines"?
    c. Show that these lines are skew.

2. **(A1.1 - E)** **(CA)** An arithmetic series has a first term of -4 and a common difference of 1. A geometric series has a first term of 8 and a common ratio of 0.5. After how many terms does the sum of the arithmetic series exceed the sum of the geometric series?   **(Cirrito 8.2.3, p261)**

3. **(A1.2 - N)** **(CI)** Mr. S. would like to solve the equation $\log_4(x + 1) + \log_{\frac{1}{16}}(x + 1) = 1$.   **(Cirrito 7.4, p244)**

    a. Explain why he cannot start by using the addition rule of logarithms.
    b. Re-express $\log_{\frac{1}{16}}(x + 1)$ in terms of log base 4 (i.e. $\log_4(??)$)
    c. Hence or otherwise, solve the equation $\log_4(x + 1) + \log_{\frac{1}{16}}(x + 1) = 1$.

4. **(C6.1, C6.3 - N)** **(CA)** Here is an equation of a cubic function, $g(x) = x^3 - 2x^2 - 3x - 5$.

    a. Provide a sketch of the function.
    b. On what interval are the function values increasing?
    c. On what interval is the function concave up?
    d. What is the slope of this cubic function at $x = 4$? Explain how you determined this value.
    e. At what point(s) would you expect the slope of the tangent line(s) to be zero? Explain your reasoning.
    f. On what domain does the function have negative slopes? Explain your reasoning.

5. **(A1.3 - N)** **(CA)** Consider the expression $\left(\frac{2}{x^2} - x\right)^{15}$,   **(Cirrito 4.1.2, p100)**

    a. Find the first three terms of this expansion.
    b. Find the last three terms of this expansion.
    c. Find the constant term of this expansion OR justify that it does not exist.

6. **(T3.5 - E) (CI)** Solve the following trigonometric equations on the domain of $-90° < x < 360°$. (NOTE: you may need a calculator to work out some of the inverse trig "stuff") **(Cirrito 10.4, p351)**

    a. $2\sin(2x) = 3\cos(x)$
    b. $2\cos^2(x) + \sin(x) = -1$

Section B (Extended Response/Investigation)

7. **(SP5.7 - N) (CA)** Given the following table for a discrete random variable, X: **(Cirrito C16.1, p533)**

x	1	2	3
$P(X=x)$	0.2	$1 - k$	

    a. Complete the table for the probability distribution. Express answer(s) in terms of k.
    b. What range of values can k take? Give your answer in the form of $a \le k \le b$, where $a, b \in Q$.
    c. Find, in terms of k, the mean of the distribution.
    d. Now suppose that $k = 0.35$. Find the mean and variance of the distribution.
    e. Now suppose that $k = 0.35$. Determine $P(X = 3 \mid X \ge 2)$

8. **(V4.2 - N) (CA)** Answer the following questions, involving the scalar (or dot) product: **(Cirrito 12.6, p440)**

    a. Find the measure of the angle between a and b if $a = i + j + 2k$ and $b = 3i + 2j - k$.
    b. Find $(a + 3b) \cdot (2a - b)$ where $a = i + j + 2k$ and $b = 3i + 2j - k$.
    c. Given that $a = 3i - 5k$ and given that $b = 2i + 7j$ and given that $c = i + j + k$, find the vector d such that $a \cdot d = -9$ and $b \cdot d = 11$ and $c \cdot d = 6$.