Math SL PROBLEM SET 72

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1. (**C6.6 - N**) (**CA**) If the velocity of a car is given by the function $v(t) = 3t^2 - 4t - 5$, where $t > 0$ and is measured in seconds, **(Cirrito 22.6, p762)**

   a. determine when the car is not moving;
   b. determine the acceleration function, $a(t)$, of the car and hence, when $a(t) = 0$.
   c. If the original position of the car was given by $s(0) = 10$, determine the position function, $s(t)$, and hence, find the time(s) when the car is at its starting position.
   d. Determine the distance travelled and the displacement in the first 3 seconds of travel.

2. (**A1.2, F2.6 - R**) (**CI**) Provide non-graphical solutions (so in other words, algebra based) for the following equations: (NOTE: you may graphically verify your soln(s)) **(Cirrito 7.4, p221)**

   a. $2^{x+1} = 3^{x-1}$ b. $2^x = 5 \times 3^{x+2}$

3. (**SP5.7 - R**) (**CA**) The discrete random variable Y has the following probability density function: $P(Y = y) = k(16 - y^2)$ for $y = 0,1,2,3,4$. **(Cirrito 16.1, p527)**

   a. Find the value of k.
   b. Draw a histogram to illustrate the distribution. Is the distribution symmetrical or asymmetrical? Is the distribution skewed left or skewed right or neither?
   c. Find $P(1 \leq y \leq 3)$.
   d. Find the mean and variance.

4. (**A1.3 - R**) (**CA**) If the coefficient of the x^2 term in the expansion of $(1 - 3x)^n$ is 90, find n. **(Cirrito 4.1.2, p103)**

5. (**SP5.8 - R,N**) (**CA**) Consider the binomial distribution: **(Cirrito 16.3, p544)**

$$P(x) = \binom{5}{x} (0.6)^x (0.4)^{5-x}, \; x = 0, 1, 2, 3, 4, 5$$

   a. Prepare a distribution table and use it to prepare a histogram.
   b. Find the mean and standard deviation in two ways:
      i. by formula
      ii. using the table of values you created in your distribution table and the TI-84

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6. (**A1.1 - R**) (**CI**) Find the sum of the first 50 terms of an arithmetic sequence given that the 15th term is 34 and the sum of the first 8 terms is 20. **(Cirrito 8.2.5, p265)**

7. **(SP5.4 - R)** **(CA)** Here is a data set showing the number of hours studied and your exam scores from last June:

hours	4	4.5	6	3.5	3	5	5.5	6.5	7	6.5
grade	65	80	83	61	55	79	85	89	92	95

   a. Find the equation of line of best fit from your calculator and find the value of the correlation coefficient.
   b. Find the "mean point". Is this "mean point" on the line of best fit?
   c. Interpret the meaning/significance of (i) the slope, (ii) the y-intercept, (iii) the r value.
   d. Effect of Outliers: Mr S forgot to add Hae Lin's data. Hae Lin studied 1 hour and scored a 99%. Re-determine the equation of the line of best fit as well as the correlation coefficient. If all you knew was the value of the correlation coefficient, what does this value now tell you?

8. Cats is a famous musical, but sometimes, the show is not sold out and there are empty seats during performances. In a large theatre (capacity of 1750 seats) where the show has been performed 1000 times, the manager kept track of the number of empty seats during the performance. **(Cirrito 13.2, p471)**

Empty seats	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
# of shows	15	50	100	170	260	220	90	45	30	20

   a. Use grid paper to draw a ***cumulative frequency graph (CFG)*** of this distribution. Use 1 unit on the vertical axis to represent 50 shows and use one unit of the horizontal axis to represent 5 seats. (NOTE: You can also do this on the TI-84 …….)
   b. Use the graph you prepared to answer the following questions:
      i. Find an estimate of the median number of empty seats.
      ii. Find an estimate of the interquartile range.
      iii. The number of shows that the number of empty sets was less than 28.
      iv. The highest 15% of the shows with empty seats are categorized as "loss shows." What is the number of empty seats above which a show is claimed as a loss?
   c. Use the information provided in the original table (as opposed to the CFG) to estimate the mean number of empty seats.