Math SL PROBLEM SET 68

1. **(CA6.2, CA6.3 - E) (CI)** Given the function $g(x) = e^{x^3 - 3x}$, determine the intervals of increase and decrease. Determine the exact coordinates of all extrema. **(Cirrito 20.2, p649)**

2. **(SP5.8 - R) (CA)** During any one production cycle, it is found that 12% of items produced by a manufacturer are defective. A sample of ten items is selected at random and inspected. Find the probability that: **(Cirrito 16.3, p544)**

   a. No defective items are found,
   b. At least 2 defective items are found
   c. A batch of 1000 items are now inspected. How many of these items would you expect to be defective?

3. **(C6.2 - R) (CI)** Find the equation of the derivative function for: **(Cirrito 19.3.6, p623)**

   a. $f(x) = \sin(4x^3)$ b. $f(x) = 4\sin^3(x)$ c. $g(x) = \cos(e^{2x})$ d. $g(x) = e^{2\cos(x)}$

4. **(CA)** Here are the weights (in pounds) of random Gr 12 students at CAC. Keep in mind that it's unlikely that anyone weighs exactly 102 pounds (to 20 decimal places). Instead, if a person weighs between 101.5 and 102.5 pounds, we'll call 102 pounds the weight of that person. **(Oxford 8.3, p260)**

102	104	140	136	152	132	158	193	128	141
130	133	147	148	141	129	133	137	179	147
152	114	124	138	129	164	135	128	139	154
168	148	152	116	107	136	167	143	139	152

   a. Is the data discrete or continuous?
   b. Create a grouped frequency table to summarize the data. In our case, let's use 10-pound intervals: 100-109 (actually 99.5 to 109.5), 110-119 (actually 109.5 to 119.5), etc.
   c. Use the grouped frequency table to calculate the mean. Then use the actual data to calculate the mean. How do the two values for the mean compare? Explain why.
   d. Determine the interquartile range of this data set. What does the IQR represent?
   e. Prepare a frequency histogram and a frequency polygon.
   f. How probable is it that a randomly selected student weighs more than 150 pounds?

5. **(T3.5 - R) (CI)** Solve the following equations, given the specified domains: **(Cirrito 10.4, p351)**

   a. $\tan\left(\frac{1}{2}x\right) = -1$ on $0 \leq x \leq 2\pi$

   b. $\tan\left(2x - \frac{\pi}{3}\right) = -\frac{1}{\sqrt{3}}$ on $0 \leq x \leq 2\pi$

6. **(T3.6 - R) (CA)** From a point P, the angle of elevation of the top of a radio tower due north of P is 17°. From a second point, Q, due west of the radio tower, the angle of elevation is 13°. Given that P and Q are 130 meters apart, find the height of the radio tower.   **(Cirrito 9.6, p307)**

7. **(CA6.3 - E) (CI)** We want to construct a box whose base length is 3 times the base width. The material used to build the top and bottom cost $10/m² and the material used to build the sides cost $6/m². The box must have a volume of 50 m³.   **(Cirrito 21.4, p702)**

   a. Show that the cost to build the box can be modelled by the function $C(w) = 60w^2 + \frac{800}{w}$

   b. Hence, or otherwise, determine the dimensions that will minimize the cost to build the box.
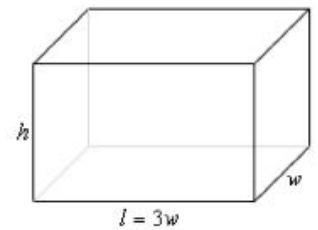
8. **(CA) (CA6.5 - N) (CA)** Mr. S wants to calculate the area between the function $y = x^2 + 1$ and the x-axis between $x = 0$ and $x = 4$. However, there seems to be a problem …….. So, to help, I have included a diagram to help us get started with an **estimate**.   **(Cirrito 22.5, p748)**

   a. Explain how the diagram is going to help us.
   b. Use the diagram to help make an estimate to the area under the curve.
   c. Is this estimate too high or too low?
   d. How can I make the estimate more accurate?