

Math SL PROBLEM SET 70

1. **(SP5.8 - R) (CA)** Apartments in my building are equipped with alarm systems to protect the apartments. The alarm system company says that their alarms are 96% reliable (that is, the alarm will trigger an alarm in 96% of all cases.) In my building, 10 apartments are equipped with these alarm systems. **(Cirrito 16.3.4, p544)**
 - a. Find the probability that all the alarm systems work properly.
 - b. Find the probability that at least half of the alarm systems work properly.
 - c. Find the probability that at most 8 of the alarm systems work properly.

2. **(F2.2, 2.5 - R) (CI)** Given the function $f(x) = 2 + \frac{1}{2x-5}$, **(Cirrito 5.3.5, p144)**
 - a. Write down the equation of each of the asymptotes,
 - b. Determine the value of each of the intercepts,
 - c. Sketch the curve of f for $-3 \leq x \leq 5$, showing the asymptotes and intercepts.

3. **(T3.6 - R) (CA)** Mr. S is about to go zip lining! He notices that the angle of depression of the zip line is 14° . If the starting platform is 100 m high and the finishing platform is on the ground, **(Cirrito 9.5, p290)**
 - a. how long is the zip line?
 - b. how much “ground distance” is there between the starting platform and the finishing platform?
 - c. You had to make an assumption to answer Q(a) and Q(b). Now assume that this assumption was NOT true and the ground “sloped away” at an angle of 6° . Now re-determine the (i) length of the zip line and (ii) the ground distance between the two platforms.

4. **(CA6.3 - R) (CI)** Find the exact coordinates of any stationary points and any inflection points for the curve $f(x) = x^3 - 2x^2 + x$. Classify any stationary points as maximum(s), minimum(s) or neither. **(Cirrito 19.2.1, p609)**

5. **(F2.4 - R) (CI)** Given the function $f(x) = x^2 - 2x - 8$, determine the: **(Cirrito 2.4.2, p44)**
 - a. values of $f(3)$ and $f(5)$,
 - b. Use the limit definition of a derivative (also expressed as using “first principles”) to develop an equation for the derivative of $f(x)$.
 - c. average rate of change between $f(3)$ and $f(5)$,
 - d. vertex,
 - e. the zeroes,
 - f. the range, if the domain were $-4 \leq x \leq 5$.

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6. **(C6.2 - N)** (CA) For the following functions,

(Cirrito 19.3.4, p620)

a. use **Symbolab** to determine the derivatives of the following functions:

i. $f(x) = 4x^3\sin(x)$ ii. $g(x) = e^{2x}\cos(x)$ iii. $h(x) = x^3\ln(x)$

b. Explain and/or generalize the rule for these derivatives.

7. **(A1.2 - R)** (CI) The following questions review the rules for logarithms:

a. write each expression as the logarithm of a single quantity: (Cirrito 7.4, p221)

i. $\log(6) + \log(x)$ ii. $\ln(y) - \ln(4)$ iii. $\log_3 M + \log_3 N - 2\log_3 P$ iv. $\log_b 12 - \frac{1}{2} \log_b 9$

b. write each logarithmic expression as a sum, difference and/or multiple of simple logarithms:

i. $\log_2(8x)$ ii. $\ln\left(\frac{3}{y}\right)$ iii. $\log(\sqrt[3]{7})$ iv. $\log_b\left(\frac{x^3}{y^2}\right)$

c. use **Symbolab** to simplify the following expressions. Comment on any generalizations that you may be observing. (Cirrito 7.4, p225)

i. (i) $5^{\log_5 x}$ (ii) $5^{\log_5 x^2}$ (iii) $5^{3\log_5 x}$ (iv) $25^{\log_5 x}$
ii. (i) $e^{\ln x}$ (ii) $e^{\ln 2x}$ (iii) $e^{2\ln x}$ (iv) $e^{x\ln a}$

8. **(CA6.3 - R)** (CI) Find the exact coordinates of any stationary points and any inflection points for the curve $y = xe^x$. Classify any stationary points as maximum(s), minimum(s) or neither.

(Cirrito 19.2.1, p609)