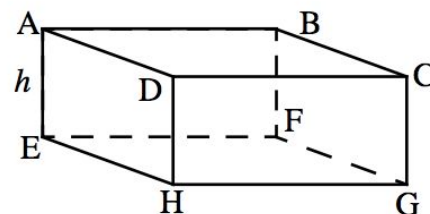


Math SL PROBLEM SET 39

Section A (Short Answer)

1. **(T3.6 - R) (CA)** A rectangular box is constructed as shown, with measurements $HG = 10$ cm, $\angle FHE = 30^\circ$, $\angle CEG = 15^\circ$. Find the height and volume of the box. **(Cirrito 9.6, p307)**



2. **(F2.7, C6.1 - R) (CA)** This question provides you with two choices:
for those of you at the IB 4/5 level, do Q(a) and for those of you at the IB 6/7 level, do Q(b)
(Cirrito 2.4.4, p57)
- a. For what value(s) of k is the line $2x = 3y + k$ a tangent to the parabola $y = x^2 - 3x + 4$?
NOTE: You now have two ways you can do this question, so try using BOTH methods.
- b. Find the value of c , for some fixed value of m , so that the line $y = mx + c$ is a tangent to the parabola, $y^2 = 4ax$, $a \neq 0$. NOTE: You now have two ways you can do this question, so try using BOTH methods.
3. **(SP5.6 - R) (CI)** Mahmoud and Alina are both “good” math students. Mr. S. has calculated that Mahmoud has a probability of 0.7 of getting a 7 in Math and that Alina has a probability of 0.6 of getting a 7 in Math. Find the probability that: **(Cirrito 15.3, p512)**
- a. Neither get a 7 in Math
- b. If only one gets a 7, then it is Alina.

Now, the situation changes. Given that Mahmoud gets a 7, then the probability that Alina gets a 7 is 0.6; however, if Mahmoud does not get a 7, then the probability that Alina gets a 7 is now 0.85.

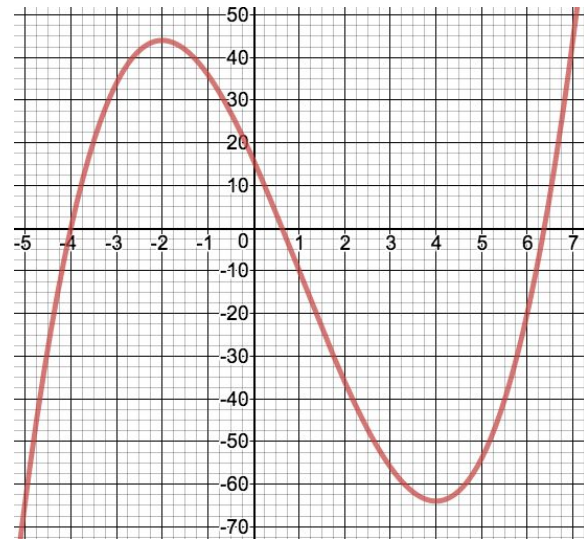
- c. Are the events independent or dependent? Explain.
- d. Draw a tree diagram to help make sense of this new information.
- e. How probable is it that neither get a 7 in Math.
- f. How probable is it that if only one gets a 7, then it is Alina
4. **(A1.1 - E) (CA)** Given the series $6 + 3 + \frac{3}{2} + \frac{3}{4} + \dots$, **(Cirrito 8.2.2, p259)**
- a. How many terms must be added to give a sum of $11 \frac{13}{16}$?
- b. How many additional terms must be added to get a sum of 13? Explain/show your thinking.

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5. **(T3.2, T3.3 - E) (CI)** Given that $\cos(\theta) = -2/5$, $\frac{\pi}{2} < \theta < \pi$, find: **(Cirrito 10.1.2, p316)**
a. $\cos(\pi - \theta)$ b. $\sin(\frac{\pi}{2} - \theta)$ c. $\tan(2\theta)$ d. $\sin^2(\theta)$

6. **(C6.1, C6.3 - N) (CI)** Here is a graph of cubic function, $y = f(x)$. **(Cirrito 19.2, p610)**

- a. If you were to draw tangent lines to this function, at what x value(s) would the tangent lines be horizontal? Explain your answer.
- b. At what x value(s) would the derivative of the function have values of 0? Explain your answer.
- c. Solve the equation $\frac{dy}{dx} = 0$ where $\frac{dy}{dx} = 3x^2 - 6x - 24$ and explain the significance of the answer.
- d. If $\frac{dy}{dx} = 3x^2 - 6x - 24$ and if $y(0) = 16$, find an equation for y .



Section B (Extended Response/Investigation)

7. **(C6.3 - N) (CI)** Draw a sketch of a function, $g(x)$, that has all of the following characteristics:
- $\lim_{x \rightarrow \infty} g(x) = -2$
 - $\lim_{x \rightarrow -3} g(x) = 4$
 - $\frac{d}{dx} g(x) > 0$ on the domain of $-\infty < x < -2$ as well as $4 < x < 8$.
 - the global (absolute) maximum is $g(8) = 12$
 - $\frac{d}{dx} g(x) = 0$ at $x = -5, -2, 4, 8$
8. **(C6.1, C6.2 - N) (CI)** Find the equation of the line that is tangent to each curve at the given x value: **(Cirrito 19.2.1, p609)**
- $y = 2x^2 + x + 4$ where $x = 2$
 - $y = -3x^2 - 6x - 5$ where $x = -1$
 - $f(x) = 2x^3 + 4x^2 - 3x - 5$ where $x = 1$
 - $g(x) = 4x^5 - 2x^3 - 8x$ where $x = -2$