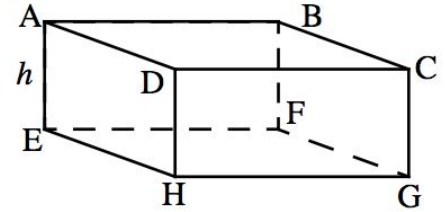


Math SL PROBLEM SET 50

Section A (Skills/Concepts Consolidation)

1. **(C6.1, C6.2 - N) (CI)** Find the equation of the line that is tangent to $f(x)$ at the given x value:
- $f(x) = 2x^2 + x + 4$ where $x = 2$ **(Cirrito 19.2.1, p609)**
 - $f(x) = 2x^3 + 4x^2 - 3x - 5$ where $x = 1$

2. **(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)**



3. **(SP5.1, SP5.2 - R) (CA)** A random sample of 167 people who own mobile phones were surveyed to collect data on the amount of time they spent per day using their cell phones. The results are displayed on the table below: **(Oxford 8.6, p276)**

Minutes per day	$0 \leq t < 15$	$15 \leq t < 30$	$30 \leq t < 45$	$45 \leq t < 60$	$60 \leq t < 75$	$75 \leq t < 90$
Number of people	21	32	35	41	27	11

- Is the data discrete or continuous? Explain.
 - Show a calculation in order to determine an estimate for the mean time spent per day.
 - Use your GDC to find the mean and standard deviation and variance of the data.
 - Find the probability that someone spends at least 60 minutes using their phone given that they spend at most 75 minutes using their phone.
4. **(CA6.3 - N) (CI)** The derivative of a function is $\frac{d}{dx}f(x) = x^3 - x^2 - 6x$, **(Cirrito 22.1, p723)**
- Determine where the original function, $f(x)$, has its extrema.
 - Determine where the original function, $f(x)$, has inflection points.
 - Determine the domain intervals in which $f(x)$ is (i) increasing, (ii) decreasing.
 - Hence, sketch the function $f(x)$.
 - Find the equation of $f(x)$, knowing that $f(0) = 2$.
5. **(F2.5 - R) (CI)** For the rational function $r(x) = \frac{2x-5}{x-2}$, $x \neq 2$, determine: **(Cirrito 5.3.5, p144)**
- the equation(s) of the asymptote(s) and the intercepts of $r(x)$.
 - Evaluate $\lim_{x \rightarrow \infty} r(x)$.
 - Rewrite the equation of $r(x)$ in the form $r(x) = a + \frac{b}{x-2}$; $a, b \in \mathbb{Z}$.
 - Hence, determine the transformations that were applied to $y = \frac{1}{x}$ to create $r(x)$

Math SL PROBLEM SET 50

Section B (Skills/Concepts Practice)

6. **(F2.4, F2.8, C6.3 - R,N) (CI)** Zeina throws a stone vertically upwards from the top of a building 250 m high. The height of the stone, $h(t)$ meters above the ground t seconds after being thrown is modeled by the equation $h(t) = 250 + 100t - 10t^2$, $t \geq 0$. **(Cirrito 3.1.2, p65)**

- How long does it take for the stone to reach a height of 50 m above the building?
- How long does it take for the stone to reach a height of 50 m above the ground?
- What is the maximum height of the stone?
- How long does it take for the stone to reach the ground?
- What is the speed of the stone when it hits the ground?

7. **(SP5.7 - N) (CA)** For a discrete random variable, X (say golf scores on a par 72 course), the probability distribution is defined by the table below. Find: **(Cirrito C16.1, p533)**

x	-2	-1	0	1	2
$P(X=x)$	k	$5k^2$	0.35	0.15	0.1

- The value of the constant, k .
 - Hence, find $P(X < 0 \mid X \leq 1)$
 - Find $E(X) \Rightarrow$ i.e. the **expected value** of X
8. **(SP5.4 - R) (CA)** The table below gives the number of hours spent studying for a math exam and the final exam grade.

Hours studied	2	5	1	0	4	2	3
Exam grade	77	92	70	63	90	75	84

- Use your calculator to determine the equation of the line of best fit.
- If Anna studies 2.75 hours, what grade should she expect?
- If Samo studies 10 hours, what grade should he expect? Explain your answer.
- How many hours should Stefanie study in order to get a grade of 97%.
- Write down the value of the correlation coefficient and explain what it means in the context of this problem.