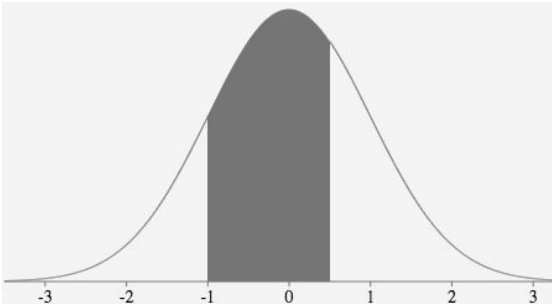
Math SL PROBLEM SET 80

Section A (Skills/Concepts Consolidation)

1. **(SP5.9 - R) (CA)** Reaction times of SL Math students are known to be normally distributed with a mean of 0.76 seconds and a standard deviation of 0.06 seconds. The graph included shows a standardized normal distribution, where the shaded region shows the probability of a randomly selected person having a reaction time between 0.70 seconds and 0.79 seconds.



   a. Determine $P(X \geq 0.7)$
   b. Determine $P(0.70 \leq X \leq 0.79)$
   c. Determine $P(0.70 \leq X \leq 0.79 \mid X \geq 0.70)$

   Three percent of the SL Math students have a reaction time less than Q seconds.

   d. Find the value of Q and show this information on the graph of the distribution.

2. **(T3.4 - R) (CI)** The table below shows the depth of water at the end of a pier at various times (measured in hours after midnight on the first day of the month.) Plot the data as a graph and determine a sinusoidal model that can be used to model the depth of the water. Use your model to predict the time of the next high tide. **(Cirrito 10.5, p361)**

t (hr)	0	3	6	9	12	15	18	21	24	27	30	33
d (m)	16.20	17.49	16.51	14.98	15.60	17.27	17.06	15.34	15.13	16.80	17.42	15.89

3. **(F2.6; C6.1, C6.5 - R) (CI)** Given the function $g(x) = 2e^{-x} - 1$, **(Cirrito 5.3.3, p131)**
   a. State the transformations that were applied to $y = e^x$.
   b. Find the asymptote(s) and intercept(s) of g and sketch.
   c. Find the equation of the inverse of $g(x)$ and sketch $g^{-1}(x)$.
   d. Find the equation of the line that is tangent to $f(x)$ at $x = -\ln 2$.
   e. Solve for a if $\int_0^a g(x)\,dx = \frac{-2}{e^2}$.

4. **(F2.5, C6.1, C6.5 - R) (CI)** Given the functions $f(x) = \frac{x-3}{x-1}$, $x \neq 1$ and $g(x) = \frac{x+4}{x+2}$, $x \neq -2$; **(Cirrito 5.3.5, p144)**
   a. Rewrite $f(x)$ and $g(x)$ in the form of $y = \frac{a}{x-b} + c$ to help in identifying transformations of the parent function $y = \frac{1}{x}, x \neq 0$.
   b. Sketch each of $f(x)$ and $g(x)$.
   c. Hence, or otherwise, solve the inequality $f(x) > g(x)$.

Math SL PROBLEM SET 80

d. Find the equation of the line that is tangent to $f(x)$ at $x = 5$. What is the significance of the slope of the tangent line?

e. Since you have rewritten the equation for $f(x)$, evaluate $\int_4^7 f(x)\,dx$.

Section B (Skills/Concepts Practice)

5. **(A1.2 - R) (CI)** SKILL: Laws of Exponents. Simplify the following, leaving your final answer using only positive exponents.

a. $\frac{(-2)^3 \times 2^{-3}}{(x^{-1})^2 \times x^3}$ b. $\frac{(-a)^3 \times a^{-4}}{(b^{-2})^{-2} b^{-5}}$ c. $\frac{(x-1)^{-3}}{(x+1)^{-1}(x^2-1)^2}$ d. $\frac{y(x^2)^{-1} + x^{-1}}{x+y}$

6. **(A1.2 - R) (CI)** SKILL: Laws of Logs. If $\log a = -5$, $\log b = 3$ and $\log c = 4$, evaluate each expression: (i) $\log\left(\frac{ab^3}{100}\right)$ (ii) $\log\left(a^2 b\sqrt{c^3}\right)$

7. **(A1.2 - R) (CI)** SKILL: Laws of Logs: If $\log_3 x = K$, write each of the following in terms of K.

a. $\log_3\left(\frac{x^5}{81}\right)$ b. $\log_3\left(\sqrt[4]{9x^8}\right)$

8. **(A1.3 - R) (CI)** SKILL: Binomial Expansion. Expand the following expressions:

a. $(p+q)^6$ b. $(x - 2y)^6$ c. $(x^2 - 2y)^7$ d. $(2w^2 + \frac{1}{w})^7$

9. **(A1.2 - R) (CI)** SKILL: Laws of Logs. Are each of the following true or false? Explain.

i. $\log_b 2 + \log_b 3 = \log_b 5$ ii. $\log 8 = -\log \frac{1}{8}$ iii. $\log_b 2 - \log_b \sqrt{2} = \log_b \sqrt{2}$

iv. $\log 3x^4 = 4 \log 3x$ v. $\frac{\log_2 42}{\log_2 7} = \log_2 6$ vi. $\frac{\log 7}{\log 343} = \frac{1}{3}$

Section C (Skills/Concepts HW)

10. Sigma Notation: Cirrito, Exercise 8.2.2, p260, Q4
11. Laws of Exponents: Cirrito, Exercise 7.1.1, p200, Q1def,7acd
12. Laws of Logarithms: Oxford, Exercise 4O, p126, Q3,5
13. Binomial Expansion: Oxford, Exercise 6N, p187, Q6,7,8