

Math SL PROBLEM SET 53

Section A (Short Answer)

1. **(C6.2 - R) (CI)** Find the derivatives of the following functions: **(Cirrito 19.1, p601; Cirrito 19.3, p618)**

a. $y = (3x^2 + 2x)^4$ b. $y = 3\sin^2(x) + 5$ c. $y = \ln(2x + 7)$ d. $y = 5e^{2x}$

2. **(C6.4 - E) (CI)** Find the antiderivatives of the following derivatives: **(Cirrito 22.3, p731)**

a. $\frac{dy}{dx} = x^2 + 3x - 4$ b. $\frac{dy}{dx} = -2\sin(2x)$ c. $\frac{dy}{dx} = 6e^{3x} + 2$

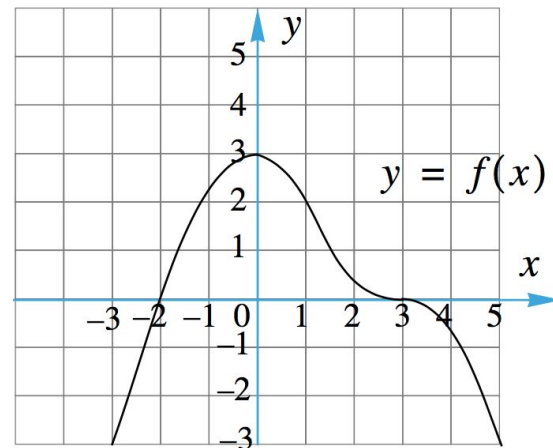
3. **(F2.7 - R) (CI)** Find the value of k such that the equation $2x^2 + kx + 2k = 0$ has exactly one solution. **(Cirrito 2.4, p41)**

4. **(A1.3 - R) (CI)** Find the term independent of a in the expansion $(a - \frac{1}{a})^8$. **(Cirrito 4.1, p95)**

5. **(F2.3 - R) (CI)** The graph of $y = f(x)$ is shown in the diagram. Using a different set of axes for each graph, sketch the graphs of the following, showing clearly any intercepts with the axes and any stationary points (extrema and/or inflection points).

(Cirrito 6.1, p167; Cirrito 6.2, p177)

a. $y = -\frac{2}{3}f(x - 3)$
b. $y = f(2x) + 3$



6. **(C6.5 - E) (CA)** Evaluate the following integrals and include a sketch from your TI-84 for each integral and explain what is “going on” with these three integrals. **(Cirrito 22.5, p748)**

a. $\int_{-2}^2 (4 - x^2) dx$ b. $\int_2^4 (4 - x^2) dx$ c. $\int_{-2}^4 (4 - x^2) dx$

Math SL PROBLEM SET 53

Section B (Extended Response/Investigation)

7. **(V4.1, V4.2 - R) (CI)** Answer the following vector questions: **(Cirrito 12.4, p423)**

a. If $\vec{OA} = 3i - 2j + k$ and $\vec{OB} = i + 2j$, find $2\vec{OB} + 3\vec{AB}$

b. The angle between the vectors $\mathbf{u} = 2i - j + 3k$ and $\mathbf{v} = i + 4j - 2k$ is θ . Find a given that

$$\cos(\theta) = \frac{a}{\sqrt{14 \times 21}}.$$

c. Find a unit vector perpendicular to $2i + j - 3k$.

8. **(F2.1, F2.2, F2.4 - R) (CI)** Given the function $g(x) = x^2 + 2x + 3$, where $x > -1$. **(Cirrito 5.4, p148)**

a. Use calculus to find the vertex of $g(x)$.

b. Hence, or otherwise, find the inverse, $g^{-1}(x)$.

c. On the same set of axes, sketch the graphs of $g(x)$ and $g^{-1}(x)$, labeling all intercepts.

d. Will there exist a value of x such that $g(x) = g^{-1}(x)$? If so, find its value. If not, explain why not.