

1. **(GT 3.8 - R) (CI)** Given  $2\sin^2(x) - \cos(x) + 1 = 0$ , use a substitution of a trigonometric identity to create an equivalent equation in terms of only one trigonometric function (Hint: cosine) and hence solve the equation on  $0 < x < 2\pi$ .

*(Oxford, Chap 13D, p.455)*

2. **(SP 5.7 - 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.

*(Cirrito C16.1, p533)*

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

- a. Find the value of the constant,  $k$ .
- b. Hence, find  $P(X < 0 | X \leq 1)$
- c. Find  $E(X) \Rightarrow$  i.e. the **expected value** of  $X$ .

3. **(CA 5.7, 5.8 - N) (CI)** For the function  $f(x) = 2x^3 - 3x^2 - 12x$  determine:

*(Cirrito 20.2, p.649)*

- a. the equation of the second derivative of  $f(x)$ , that is, determine  $f''(x)$ .
- b. the zeroes of  $f''(x)$ .
- c. Hence or otherwise, find the coordinates of the **inflection points** of  $f$ .
- d. Hence or otherwise, find the **intervals of concavity** of  $f$ .
- e. **(CA)** Sketch a graph of  $f$ . Then use your calculator and graph  $f$  and then compare.

4. **(C 5.3 - E) (CI)** Find the equations of derivatives of the following functions:

*(Cirrito 19.1, p.608)*

- a.  $g(x) = 4x^3 - 2x^2 + 12x + 10$
- b.  $f(x) = \frac{x^3 + 3x - 1}{x}$
- c.  $k(x) = 2\sqrt{x} - \sqrt[3]{x^2}$
- d.  $m(x) = \frac{2}{x^2} + \frac{3}{x^3} + 2$

5. (**GT 3.6 - E**) (**CI**) Given that  $\tan(x) = \frac{a}{b}$  and  $0^\circ < x < 90^\circ$ , find each of the following values in terms of  $a$  and  $b$ :

(*Cirrito 10.1, p.315*)

- a.  $\sin(x)$
- b.  $\cos(x)$
- c.  $\sin(2x)$
- d.  $\cos(2x)$
- e.  $\sin^2 x + \cos^2 x$

6. (**NA 1.3 - E**) (**CA**) A series is defined as  $\log_2(3) + \log_2(3)^2 + \log_2(3)^3 + \log_2(3)^4 + \dots$

(*Cirrito 8.2, p.252*)

- a. Determine the value of the first term  $U_1$ , and the common ratio  $r$ .
- b. Determine the smallest value of  $n$  such that  $S_n > 1000$ .

7. (**F 2.6, 2.7 - E**) (**CI**) Given the function  $q(x) = 2x^2 - 3x + 2$ , determine:

(*Cirrito 2.4.1, p.41*)

- a. The number of  $x$ -intercepts of  $q(x)$ .
- b. The value of  $K$  in the linear function  $f(x) = -x + K$  such that the equation  $q(x) = f(x)$  has exactly one solution.
- c. Interpret the meaning of the scenario in Q(b). (think about it graphically)

8. (**C 5.4 - N**) (**CI**) Determining the equation of a tangent line without a calculator. Given a function:  $g(x) = 2x^3 - 4x^2 + x - 6$ .

(*Cirrito 20.1, p.643*)

- a. Determine  $\frac{d}{dx}g(x)$ .
- b. Hence find the value of the gradient of  $g(x)$  when  $x = -1, 0, 1, 2$ .

$x$	-1	0	1	2
$\frac{d}{dx}g(x)$				

- c. Using  $g(x)$ , determine the  $y$ -values when  $x = -1, 0, 1, 2$ .

$x$	-1	0	1	2
$g(x)$				

- d. Create a line using the gradient from part b, that passes through the point from part c. This is the tangent line to  $g(x)$  at point  $x$ . Do this for  $x = -1, 0, 1, 2$ .