Math SL PROBLEM SET 64

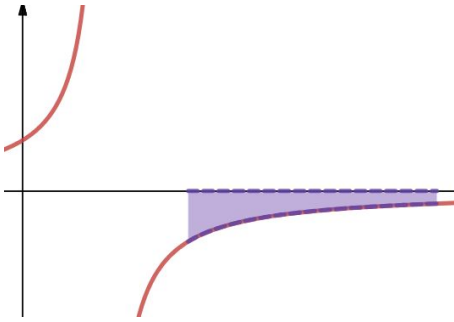
Section A (Short Answer)

1. (**C6.1 - R**) (**CI**) Find the coordinate(s) on the graph of $f(x) = 2x^3 - 7x + 1$ at which the tangent line is parallel to $5x - y = 2$ **(Cirrito 20.1, p643)**

2. (**T3.5 - R**) (**CI**) Given the function $f(x) = 2\sin^2(x) - \sin(x)$ on the domain of $-\pi \leq x \leq \pi$. **(Cirrito 10.4, p351)**
   a. Solve for the zeroes of $f(x)$, i.e. solve $2\sin^2(x) - \sin(x) = 0$.
   b. Find the equation of the line normal to $f(x)$ at the first positive zero.

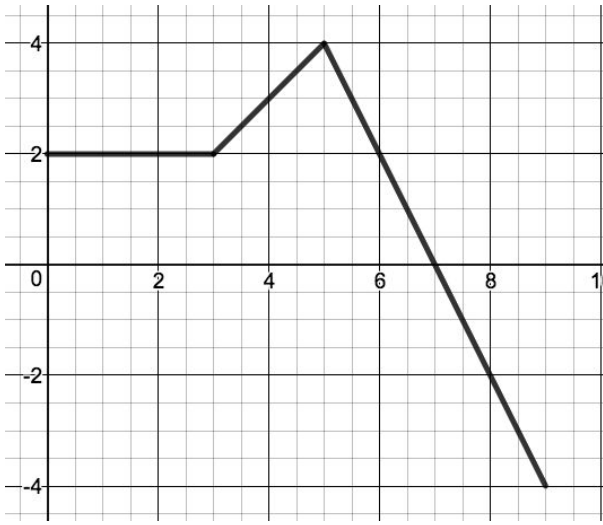
3. (**V4.2 - R**) (**CI**) For what value(s) of n are the vectors $\begin{pmatrix} 3n \\ 2n+3 \end{pmatrix}$ and $\begin{pmatrix} 2n-1 \\ 4-2n \end{pmatrix}$ perpendicular? Otherwise, show that it is not possible. **(Cirrito 12.6, p432)**

4. (**C6.5 - E**) (**CI**) The diagram shows part of the graph of $y = \frac{1}{1-x}$. The area of the shaded region between $x = 2$ and $x = k$ is exactly -ln4 units. Find the exact value of k. **(Cirrito 22.5, p748)**



5. (**V4.1, V4.2 - E**) (**CA**) Find a unit vector that makes a 60° angle with $\mathbf{u} = 3i + 4j$. **(Cirrito 12.5, p429)**

6. (**C6.5 - N**) (**CI**) Determine the value of the following definite integrals, given the graph of the function $y = g(x)$. **(Cirrito 22.5, p748)**
   a. (i) $\int_0^3 g(x)dx$ (ii) $\int_0^6 g(x)dx$ (iii) $\int_0^9 g(x)dx$
   b. (i) $\int_0^6 (g(x) + 3)\,dx$ (ii) $\int_0^6 -3g(x)dx$ (iii) $\int_0^6 g(3x)dx$



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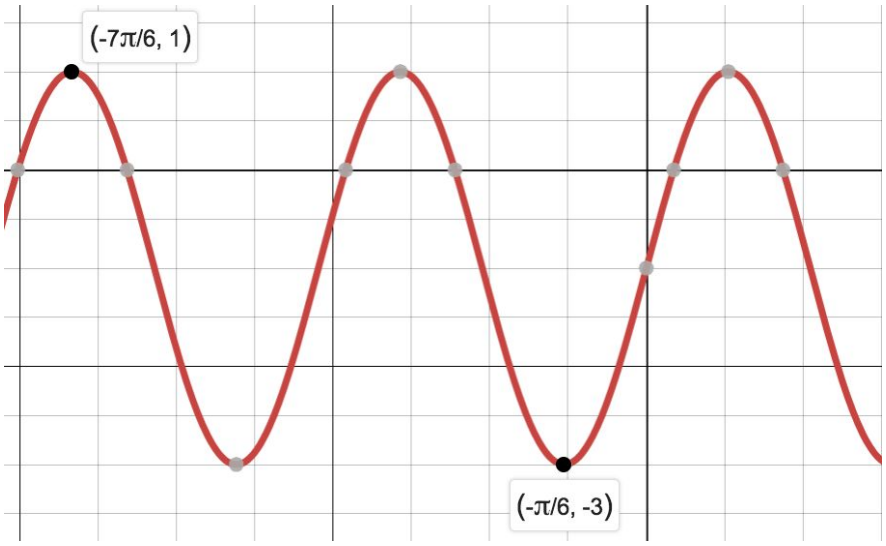
Section B (Extended Response/Investigation)

7. (**T3.5, C6.1, C6.2, C6.5 - E**) (**CI**) You are given a graph of the function, $g(x) = A \sin(Kx) + D$. **(Cirrito 10.3, p337; 20.2, p649; 22.5, 748)**



a. Find the values of A, K and D. Show/explain your work.
b. Write a cosine equation for $g(x)$.
c. Determine the equation of the line that is tangent to $g(x)$ at $x = 1$.
d. The first two positive zeroes of g(x) are $x_1 = a$ and $x_2 = b$. Find the values of a and b.
e. Evaluate $\int_a^b g(x)dx$

8. (**SP5.7 - E**) (**CA**) Mr S has set up the following game to raise some money for the Senior class. Three dice are thrown. If a 1 or a 6 is rolled somewhere on these three dice, you will be paid \$1, but if neither is rolled, you will pay \$5. **(Cirrito 16.2, p535)**

a. What is the probability that you will win \$1? (HINT: consider cases, binomials or trees)
b. Complete the following probability distribution table for the random variable X, which represents the number of dollars won in the game.

x	-5	1
$P(X = x)$		

c. How much would you expect to gain (or lose) in (i) one game? (ii) nine games?
d. Mr D would like to make the game fair. How much should you now be paid if you win?