Math SL PROBLEM SET 83

Section A (Skills/Concepts Consolidation)

1. **(C6.1 - R) (CI)** Find the equations of the tangents to the following curves at the points indicated: **(Cirrito 20.1, p646)**

   a. $y = xe^x$ at $(1,e)$ b. $f(x) = \frac{x}{sin(x)}$ at $\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$ c. $y = \ln(x + 1)$ at $(e - 1, e - 1)$

2. **(C6.4 - R) (CI)** Find the equations of the antiderivatives of the following: **(Oxford 9F, p300)**

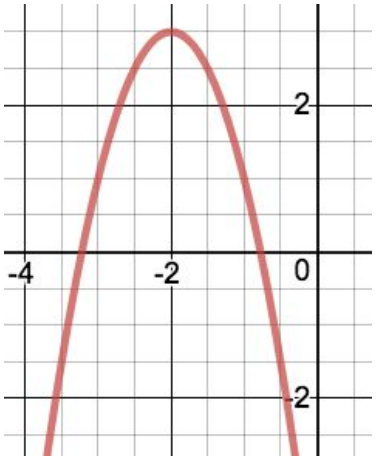
   a. $\int (9x^2 - 3)cos(x^3 - x)\,dx$ b. $\int \frac{cos(x) - 2x}{sin(x) - x^2}\,dx$

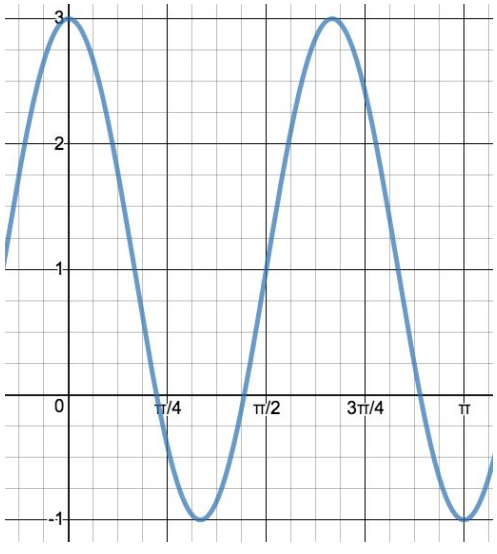
3. **(C6.3 - R) (CI)** Consider the function $g(x) = \sin(x) + \cos(x)$ for $0 \leq x \leq 2\pi$. To analyze this function: **(Cirrito, 20.2, p649)**
   a. find the x- and y-intercepts;
   b. find the intervals on which g is increasing and decreasing and the extrema points;
   c. find the intervals on which g is concave up and concave down and the inflexion points;
   d. Use this information to sketch the graph of g.

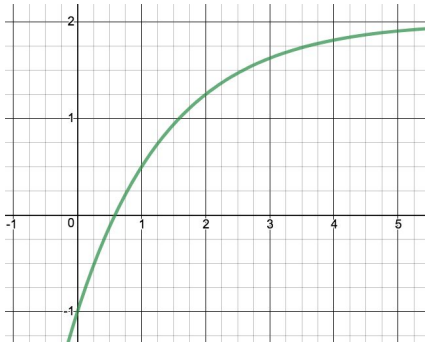
4. **(SP5.8 - R) (CA)** The random variable X has the following probability distribution: **(Oxford 15.1, p520)**
   a. Find the value of k.
   b. Find $E(X)$ and variance of X.
   c. Find the $P(X > 0)$
   d. Find the $P(X = 1|X > 0)$

x	-1	0	1	2
$P(X = x)$	$2k$	$4k^2$	$6k^2$	k

5. Determine the equations of the following functions from their graphs.







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Section B (Skills/Concepts Practice)

6. **(V4.2 - R) (CI)** SKILL: Scalar Product of Vectors. Find the exact measure of the angle between the vectors $\boldsymbol{v}_1 = \boldsymbol{i} + \boldsymbol{k}$ and $\boldsymbol{v}_2 = \boldsymbol{j} + \boldsymbol{k}$.

7. **(V4.2 - R) (CI)** SKILL: Scalar Product of Vectors. Given the vectors $\boldsymbol{v}_1 = \begin{pmatrix} 10 \\ c \\ 1 \end{pmatrix}$ and $\boldsymbol{v}_2 = \begin{pmatrix} c \\ 3c \\ 3 \end{pmatrix}$. Find the value(s) of c for which the vectors are (a) parallel and (b) perpendicular ⇒

8. **(V4.2 - R) (CI)** Consider the vectors $\boldsymbol{a}$, $\boldsymbol{b}$ and $\boldsymbol{c}$ such that $\boldsymbol{a} \bullet \boldsymbol{c} = 3$ and $\boldsymbol{b} \bullet \boldsymbol{c} = 4$. Given that the vector $\boldsymbol{d} = \boldsymbol{a} + t\boldsymbol{b}$ is perpendicular to $\boldsymbol{c}$, find the value of t.

9. **(T3.3) (CI)** SKILLS: Trig Identities: Find the exact values:
   a. $\cos(15°)$ b. $\sin(75°)$

10. **(T3.3) (CI)** SKILL: Trig Identities: Given that $\tan(x) = -3$ where $\frac{\pi}{2} \leq x \leq \pi$, evaluate:
    a. $\sin(2x)$ b. $\tan(2x)$

Section C (Skills/Concepts HW)

11. Oxford, Exercise 13B, p453, Q1
12. Oxford, Exercise 13E, p460, Q6
13. Oxford, Exercise 13I, p474, Q6,7