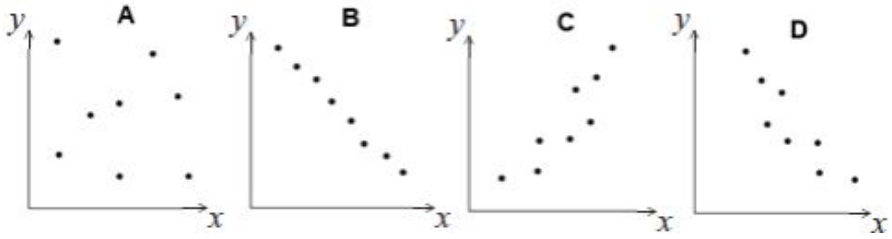
Math SL PROBLEM SET 73

1. (**C6.2 - R**) (**CI**) The slope of the curve $y = x^2 - 4x + 6$ at the point (3,3) is equal to the slope of the curve $y = 8x - x^2$ at (a,b). Find the value of a and b. **(Cirrito 20.1, p643)**

2. (**SP5.4 - R**) (**CI**) A survey is conducted with eight marathon runners. For each runner, x is the number of marathons the runner has completed, and y is the runner's personal best time for the marathon distance. Let r be the correlation coefficient. **(Oxford 10.4, p349)**

   a. Write down the possible minimum and maximum values of r.
   b. Given that $r = -0.85$, which one of the diagrams below best represents the data?



   c. For the data in diagram C, which two of the following phrases describe the correlation between x and y:
   perfect, zero, linear, strong positive, strong negative, weak positive, weak negative

3. (**C6.5 - N**) (**CI**) Evaluate the following definite integrals. Use your TI-84 to graphically verify your result and include a diagram. **(Cirrito 22.4, p740)**

   a. $\int_{-2}^{1} (3x^2 - 4x^3)\,dx$ b. $\int_{1}^{5} \frac{5}{t^2}\,dt$ c. $\int_{0}^{\pi} cos(\frac{1}{2}x)\,dx$ d. $\int_{1}^{3} \frac{a^5+2}{a^2}\,da$

4. (**V4.1 - R**) (**CA**) Triangle TRI is defined as follows:

$$\overrightarrow{OT} = \begin{pmatrix} 3 \\ -1 \end{pmatrix};\ \overrightarrow{TR} = \begin{pmatrix} 5 \\ 6 \end{pmatrix};\ \overrightarrow{TR} \cdot \overrightarrow{IR} = 0;\ \overrightarrow{TI} = kj$$

   where k is a scalar and j is a **unit vector in the y-direction**. **(Cirrito 12.3, p415)**

   a. Draw an accurate diagram of ΔTRI.
   b. Write the vector $\overrightarrow{IR}$.
   c. Find the measure of angle RIT.

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5. **(CA6.2 - R) (CI)** Determine the derivative of the following functions:

(Oxford 7.3, p208)

a. $y = x^2 \sin(x)$ b. $y = xe^{2x}$ c. $y = \sin(\cos(2x))$ d. $y = e^x \ln(x^2)$

6. **(V4.3 - R) (CA)** A line, L_1, goes through point P whose position vector is $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$ and this line is parallel to the vector $3\boldsymbol{i} + 7\boldsymbol{j}$. Find: **(Cirrito 12.7, p444)**

a. the vector equation of this line;
b. the parametric equation of this line;
c. the Cartesian equation of this line;
d. the angle the line makes with the x-axis

7. **(C6.6 - N) (CI)** If the velocity of a car is given by the function $v(t) = 3t^2 - 18t + 15$, where $t > 0$ and is measured in seconds, **(Cirrito 22.6, p762)**

a. determine when the car is not moving;
b. determine the acceleration function, $a(t)$, of the car and hence, when $a(t) = 0$.
c. If the position of the car at $t = 1$ was 3 (i.e $s(1) = 3$), determine the position function, $s(t)$
d. Evaluate and interpret $\int_0^2 v(t)dt$ as well as $\int_0^2 |v(t)|\,dt$.
e. Determine the distance travelled and the displacement in the first 3 seconds of travel.

8. **(C6.6 - N) (CA)** If the velocity of a car is given by the function $v(t) = -1 + e^{\sin(t)}$, where $0 \leq t \leq 7$ and is measured in seconds, **(Cirrito 22.6, p762)**

a. determine when the car is not moving;
b. determine the acceleration function, $a(t)$, of the car and hence, when $a(t) = 0$.
c. evaluate and interpret $\int_1^5 v(t)dt$ as well as $\int_1^5 |v(t)|\,dt$.
d. determine the distance travelled and the displacement in the first 7 seconds of travel.