**2.** A curve $C$ has equation $y = f(x)$ where

$$f(x) = (2 - kx)^5$$

and $k$ is a constant.

Given that when $f(x)$ is divided by $(4x - 5)$ the remainder is $\frac{243}{32}$

(a) show that $k = \frac{2}{5}$

**(2)**

(b) Find the first three terms, in ascending powers of $x$, of the binomial expansion of

$$\left(2 - \frac{2}{5}x\right)^5$$

giving each term in simplest form.

**(3)**

Using the solution to part (b) and making your method clear,

(c) find the gradient of $C$ at the point where $x = 0$

**(2)**

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

**Question 2 continued**

**Question 2 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**Question 2 continued**

**(Total for Question 2 is 7 marks)**

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

**3.** A sequence $a_1, a_2, a_3, \ldots$ is defined by

$$a_n = \cos^2\left(\frac{n\pi}{3}\right)$$

Find the exact values of

(a) (i) $a_1$

(ii) $a_2$

(iii) $a_3$

**(3)**

(b) Hence find the exact value of

$$\sum_{n=1}^{50}\left\{n + \cos^2\left(\frac{n\pi}{3}\right)\right\}$$

You must make your method clear.

**(4)**

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA