11. (a) Find the first 3 terms, in ascending powers of x, of the binomial expansion of

$$\left(2-\frac{x}{16}\right)^9$$

giving each term in its simplest form.

(4)

$$f(x) = (a+bx)\left(2-\frac{x}{16}\right)^9, \text{ where } a \text{ and } b \text{ are constants}$$

Given that the first two terms, in ascending powers of x, in the series expansion of $f(x)$ are 128 and $36x$,

(b) find the value of a,

(2)

(c) find the value of b.

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(2)

(a) $\left(2-\frac{x}{16}\right)^9 = 2^9 + 2^8\left(\frac{-x}{16}\right)9 + 2^7\left(\frac{-x}{16}\right)^2 \cdot \frac{9\cdot 8}{1\cdot 2} + \dots$

$= 512 - 144x + 18x^2$

(b) $f(x) = (a+bx)\left\{2-\frac{x}{16}\right\}^9$ and taking 1st 3 terms

$= (a+bx)(512 - 144x + 18x^2)$ to 3 terms

$= 512a + x(512b - 144a) + \dots$

But these first two terms are 128 and $36x$

So $512a = 128 \Rightarrow a = {}^{128}/_{512} = \frac{1}{4}$

(c) and $512b - 144a = 36$

$512b - 36 = 36$

$512b = 72$

$b = \frac{72}{512} = \frac{9}{64}$