9 (a) Show that the first four terms of the expansion of $(1 - x)^{-k}$, $k \neq 0$, in ascending powers of x can be written as

$$1 + kx + \frac{k(k+1)}{2}x^2 + \frac{k(k+1)(k+2)}{6}x^3$$

(3)

(b) Expand $(1 + kx)^{\frac{1}{2}}$, $k \neq 0$, in ascending powers of x, up to and including the term in x^3, simplifying your terms.

(3)

Given that the coefficients of x^2 in the two expansions are equal,

(c) find the value of k.

(3)

Given that $\sqrt{15} = \lambda\sqrt{\frac{3}{5}}$

(d) find the value of λ.

(2)

(e) Hence, using your value of k and one of your expansions with a suitable value of x, obtain an approximation for $\sqrt{15}$

(4)

Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 15 marks)