

Let $f(x) = \frac{1}{\sqrt{1+x}} + \frac{1}{\sqrt{1-2x}}$ and approximate $f(x)$ when x is almost negligible (that is x is very small)

SOLUTION :

$$f(x) = \frac{1}{\sqrt{1+x}} + \frac{1}{\sqrt{1-2x}}$$

$$= (1+x)^{-1/2} + (1-2x)^{-1/2}$$

$$= 1 - \frac{1}{2}x + \left(\frac{-1}{2}\right)\left(\frac{-1}{2}-1\right)\frac{x^2}{2!} \dots$$

$$+ 1 + 2x \left(\frac{-1}{2}\right)x + \left(\frac{-1}{2}\right)\left(\frac{-1}{2}-1\right)\frac{(2x)^2}{2!} \dots$$

$$= \left(1 - \frac{1}{2}x\right) + (1 - x)$$

$$\approx 2 - \frac{3}{2}x$$