

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

HINT: x is very small means you can avoid higher powers of x that is you can avoid x^2, x^3, \dots and so on

SOLUTION :

The image shows a handwritten solution on lined paper. It starts with the function $f(x) = \frac{1}{\sqrt{1+x}}$. This is then written as $(1+x)^{-1/2}$. The binomial expansion is shown as $1 - \frac{1}{2}x + \frac{(-1/2)(-1/2-1)}{2!}x^2 + \dots$. The next line shows the approximation $\approx 1 - \frac{1}{2}x + 0$. Finally, it concludes with $\therefore f(x) \approx 1 - \frac{1}{2}x$.

$$f(x) = \frac{1}{\sqrt{1+x}}$$
$$= (1+x)^{-1/2}$$
$$= 1 - \frac{1}{2}x + \frac{(-\frac{1}{2})(-\frac{1}{2}-1)}{2!}x^2 + \dots$$
$$\approx 1 - \frac{1}{2}x + 0$$
$$\therefore f(x) \approx 1 - \frac{1}{2}x$$