1. (a)

$$\begin{aligned}\frac{1-\sec x}{\tan^2 x} &= \frac{1-\frac{1}{\cos x}}{\frac{\sin^2 x}{\cos^2 x}} \\ &= \frac{\cos^2 x - \cos x}{\sin^2 x} \\ &= -\frac{\cos x(\cos x - 1)}{\cos^2 x - 1} \\ &= -\frac{\cos x(\cos x - 1)}{(\cos x - 1)(\cos x + 1)} \\ &= -\frac{\cos x}{\cos x + 1} \\ &= -\frac{1}{1+\sec x}\end{aligned}$$

When x is near $2\pi n$, there is subtraction of nearly equal numbers.

(b)

$$\begin{aligned}\frac{1-(1-x)^3}{x} &= \frac{1-(1-3x+3x^2-x^3)}{x} \\ &= \frac{3x-3x^2+x^3}{x} \\ &= 3-3x+x^2\end{aligned}$$

When x is near zero, there is subtraction of nearly equal numbers.

(c)

$$\begin{aligned}\frac{1}{1+x} - \frac{1}{1-x} &= \frac{(1-x)-(1+x)}{1-x^2} \\ &= \frac{2x}{x^2-1}\end{aligned}$$

When x is near ± 1, there is subtraction of nearly equal numbers.

2.

$$x = \frac{-3 \pm \sqrt{9+4\times 8^{-14}}}{2}$$

$$x_1 = \frac{-3-\sqrt{9+4\times 8^{-14}}}{2} = -3$$

$$x_2 = \frac{-3+\sqrt{9+4\times 8^{-14}}}{2} = 7.57\times 10^{-14}$$

or

$$x_2 = \frac{2\times 8^{-14}}{3+\sqrt{9+4\times 8^{-14}}} = 7.58\times 10^{-14}$$

3.

$$x_1 = \frac{-b - \sqrt{b^2 + 4 \times 10^{-12}}}{2}$$

$$x_2 = \frac{2 \times 10^{-12}}{-b + \sqrt{b^2 + 4 \times 10^{-12}}}$$

4.

$$\begin{aligned} x_2 &= \frac{-b - \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{(-b - \sqrt{b^2 - 4ac})((-b + \sqrt{b^2 - 4ac}))}{2a((-b + \sqrt{b^2 - 4ac}))} \\ &= \frac{b^2 - (b^2 - 4ac)}{2a((-b + \sqrt{b^2 - 4ac}))} \\ &= \frac{4ac}{2a((-b + \sqrt{b^2 - 4ac}))} \\ &= \frac{2c}{(-b + \sqrt{b^2 - 4ac})} \end{aligned}$$