Quiz 4 Solution

Problem 1

$$\cos t = 1 - \frac{t^2}{2!} + \frac{t^4}{4!} - \frac{t^6}{6!} + \cdots$$

$$t = \frac{x^{\frac{3}{2}}}{\sqrt{2}}$$

$$\cos\frac{x^{\frac{3}{2}}}{\sqrt{2}} = 1 - \frac{\left(\frac{x^{\frac{3}{2}}}{\sqrt{2}}\right)^2}{2!} + \frac{\left(\frac{x^{\frac{3}{2}}}{\sqrt{2}}\right)^4}{4!} - \frac{\left(\frac{x^{\frac{3}{2}}}{\sqrt{2}}\right)^6}{6!} + \cdots$$

Problem 2

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$$

$$|x - \sin x| = \left|\frac{x^3}{3!} - \frac{x^5}{5!} + \frac{x^7}{7!} - \cdots\right| < \left|\frac{x^3}{3!}\right| = \frac{|x|^3}{3!}$$

$$|x| < 10^{-3} \Longrightarrow |x - \sin x| < \frac{(10^{-3})^3}{3!} = \frac{10^{-9}}{3!}$$