Worksheet #6: Asymptotic analysis

Part A

(1) Is $\tan\epsilon = o(\epsilon)$ as $\epsilon \to 0$?

(2) Is $\tan\epsilon = O(\epsilon)$ as $\epsilon \to 0$?

Part B

Let $f(t,\epsilon) = \epsilon \tan t$.

(1) Is $f(t,\epsilon)$ uniformly convergent to zero on the interval $(0,\pi/4)$ as $\epsilon \to 0$? (Hint: graph f vs t.)

(2) Is $f(t,\epsilon)$ uniformly convergent to zero on the interval $(0,\pi/2)$ as $\epsilon \to 0$?

(3) Does $f(t,\epsilon)$ converge pointwise to zero on the interval $(0,\pi/2)$?

Part C

(1) Rearrange the terms of the series to form an *asymptotic series* as $\epsilon \to 0$.

$$y(t) = \epsilon^{1/2} y_0(t) + \frac{1}{\epsilon} y_1(t) + \ln(\epsilon) y_2(t) + y_3(t) + \epsilon^2 \ln(\epsilon) y_4(t) + \epsilon^2 y_5(t) + \epsilon \ln^2(\epsilon) y_6(t)$$