Math 124 – Worksheet 13 (3.9)

(1) Show that $e^{-x} \approx 1 - x$ near $x = 0$

(2)

(a) Find the tangent line approximation to $\cos x$ at $x = \pi/4$

(b) use a graph to explain how you know whether the tangent line approximation is an under- overestimate for $0 \leq x \leq \pi/2$

(c) To one decimal place, estimate the error in the approximation for $0 \leq x \leq \pi/2$

(3) Writing g for the acceleration due to gravity, the period, T of a pendulum of length l is given by

$$T = 2\pi\sqrt{\frac{l}{g}}$$

(a) show that if the length of the pendulum changes by Δl, the change in the period, ΔT, is given by

$$\Delta T \approx \frac{T}{2l}\Delta l$$

(b) If the length of the pendulum increases by 2%, by what percentage does the period change?