Physics 371 Quiz #1 February 3, 2016

1. Expand the following functions to lowest order in $\epsilon \ll 1$:

   (a) $\frac{1}{\sqrt{1+\epsilon}} \approx 1 - \frac{\epsilon}{2}$

   (b) $\tan(\epsilon) \approx \epsilon$

   (c) $2^{\epsilon} = (e^{ln2})^{\epsilon} = e^{\epsilon ln2} \approx 1 + \epsilon ln2$

2. Simplify the below expressions

   (a) $e^{-i\pi/6} = \cos\left(\frac{\pi}{6}\right) - isin\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}-i}{2}$

   (b) $(-1)^{i} = (e^{\pm i\pi})^{i} = e^{\pm\pi}$

   (c) $\frac{2}{1+i} = \frac{2(1-i)}{(1+i)(1-i)} = 1 - i$

3. Calculate the below integrals

   (a) $\int_{-\infty}^{+\infty} e^{-x^2}\, dx = \sqrt{\pi}$

   (b) $\int_{-\infty}^{+\infty} x^3 e^{-x^2}\, dx = 0 \quad (odd\ function!)$