Homework 1

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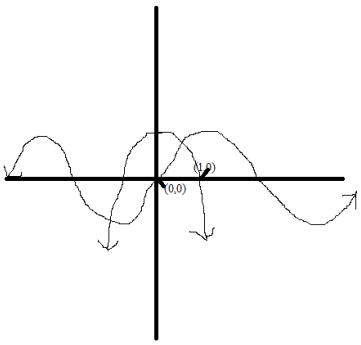
Exercise 1.11.



(a)

$$\lim_{x \to 0} f(x) = 1$$

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(b) When x is very small, the value of e^x is very close to 1. If $1 < e^x < 1 + \frac{1}{2}\epsilon$ where ϵ is machine precision, the values of e^x and 1 will become indistinguishable and the difference will go to zero. We can find the place, where they become indistinguishable at $e^x = 1 + \frac{1}{2}\epsilon$. We can approximate this using a Taylor expansion to get, $1 + \frac{1}{2}x = 1 + \frac{1}{2}\epsilon$. Thus, the switch occurs near, $x = \epsilon \approx 2 \cdot 10^{-16}$. That is why it does not happen at $x = 4 \cdot 10^{-16}$.

Exercise 1.16. The numbers $4(1 - \frac{1}{4}\epsilon) < x \leq 4(1 + \frac{1}{2}\epsilon)$ should round to 4.