

1. [9 points] Let $U = f(t)$ give the number of Facebook users in millions in year t . Suppose $f(2005) = 5.5$ and $f'(2005) = 4.9$. For this problem assume that $f(t)$ is strictly increasing.
- a. [4 points] Find and interpret, in practical terms, $f^{-1}(5.5)$.

$$f^{-1}(5.5) = \underline{\hspace{4cm}}$$

- b. [5 points] Showing work, evaluate $(f^{-1})'(5.5)$. Interpret your answer in practical terms.

$$(f^{-1})'(5.5) = \underline{\hspace{4cm}}$$

2. [8 points] Recall the function $T(x)$ that took the number of followers (in millions) of a Twitter user and returned a value from 0 to 10 called the user's Twitter celebrity index. The derivative of $T(x)$ is given by the function

$$T'(x) = \frac{1532.5 \cdot (0.6)^x}{(5 + 60(0.6)^x)^2}.$$

- a. [4 points] If $T(3) = 1.56$, compute the local linearization of $T(x)$ near $x = 3$.

- b. [4 points] Use your expression from (a) to approximate the Twitter celebrity index of a celebrity with 3.2 million followers.