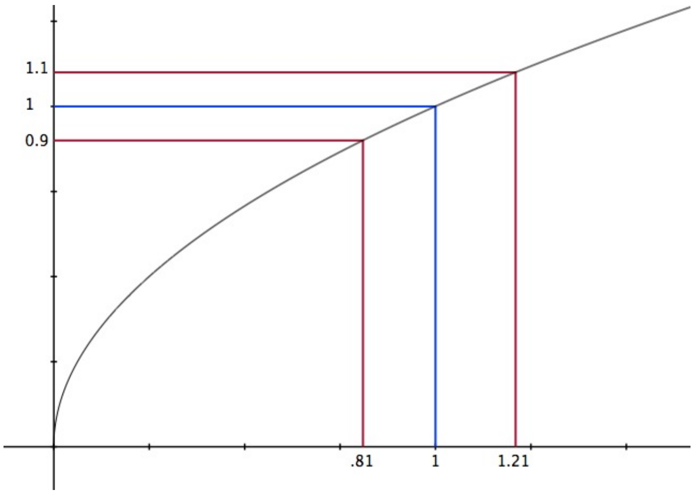
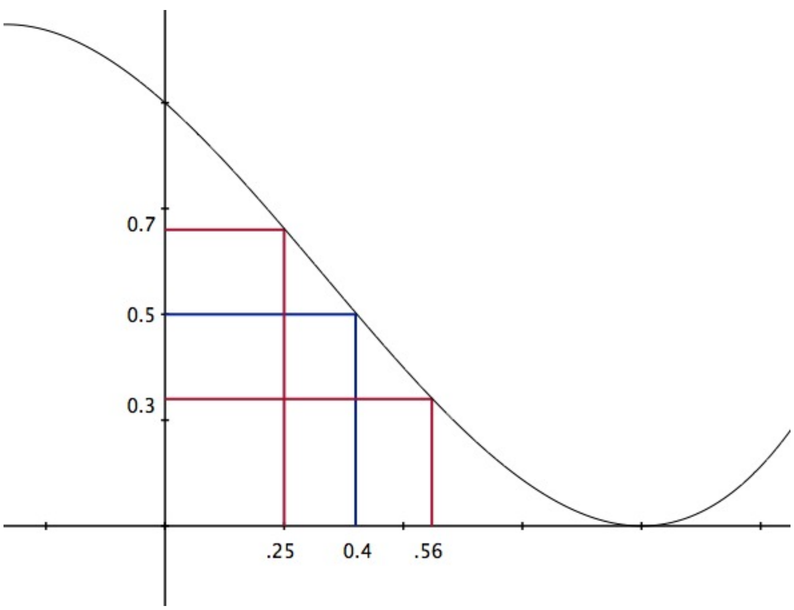
The Definition of a Limit: Examples

1. Use the given graph of $f(x) = \sqrt{x}$ to find a number δ such that if $|x - 1| < \delta$ then $|f(x) - 1| < .1$



2. Use the given graph of f to find a number δ such that if $|x - .4| < \delta$ then $|f(x) - .5| < .2$



3. Let $f(x) = 2x + 3$. It is true that $\lim_{x \to 3} f(x) = 9$.

   Find the largest value of δ such that if $|x - 3| < \delta$, then $|f(x) - 9| < 1$.

4. Let $f(x) = x^2 + 1$. It is true that $\lim_{x \to -1} f(x) = 2$.

   Find the largest value of δ such that if $|x + 1| < \delta$, then $|f(x) - 2| < .5$.

5. Given that $\lim_{x \to -3} (2x + 4) = -2$, find the largest δ corresponding to $\epsilon = \frac{1}{2}$

6. Given that $\lim_{x \to 2} (3x - 1) = 5$, find the largest δ corresponding to $\epsilon = 1/5$.

7. Given $\lim_{x\to 4}(3x-2)=10$, find the largest δ for any given ϵ
8. Given $\lim_{x\to 4}(-3x+5)=-7$, find the largest δ for any given ϵ
9. Using the ϵ, δ definition of a limit, prove that $\lim_{x\to -1}(3x+4)=1$.
10. Using the ϵ, δ definition of a limit, prove that $\lim_{x\to 4}\left(\frac{1}{4}x-3\right)=-2$.