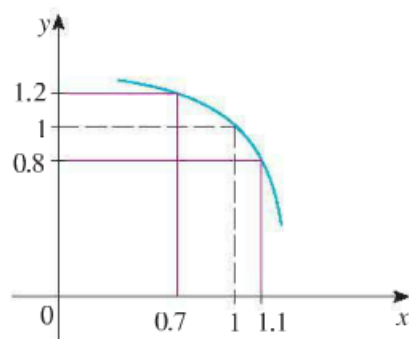


1. Use the given graph of f to find a number δ such that

$$\text{if } |x - 1| < \delta \quad \text{then} \quad |f(x) - 1| < 0.2$$



2. A machinist is required to manufacture a circular metal disk with area 1000 cm^2 .
- What radius produces such a disk?
 - If the machinist is allowed an error tolerance of $\pm 5 \text{ cm}^2$ in the area of the disk, how close to the ideal radius in part (a) must the machinist control the radius?
 - In terms of the ϵ, δ definition of $\lim_{x \rightarrow a} f(x) = L$, what is x ? What is $f(x)$? What is a ? What is L ? What value of ϵ is given? What is the corresponding value of δ ?
3. A crystal growth furnace is used in research to determine how best to manufacture crystals used in electronic components for the space shuttle. For proper growth of the crystal, the temperature must be controlled accurately by adjusting the input power. Suppose the relationship is given by

$$T(w) = 0.1w^2 + 2.155w + 20$$

where T is the temperature in degrees Celsius and w is the power input in watts.

- How much power is needed to maintain the temperature at 200°C ?
- If the temperature is allowed to vary from 200°C by up to $\pm 1^\circ\text{C}$, what range of wattage is allowed for the input power?

#s 4 - 7 Prove the statement using the ϵ, δ definition of a limit. I consider the first 2 to be fairly standard. You can do the first two more or less by rote, if need be. But #s 6 and 7 are toughies. Bonus at worst on a test.

4. $\lim_{x \rightarrow -3} (1 - 4x) = 13$

5. $\lim_{x \rightarrow -2} (3x + 5) = -1$

6. $\lim_{x \rightarrow 2} (x^2 - 4x + 5) = 1$

7. $\lim_{x \rightarrow 2} x^3 = 8$

8. Prove that $\lim_{x \rightarrow a} \sqrt{x} = \sqrt{a}$ if $a > 0$.

$$\left[\text{Hint: Use } |\sqrt{x} - \sqrt{a}| = \frac{|x - a|}{\sqrt{x} + \sqrt{a}}. \right]$$

