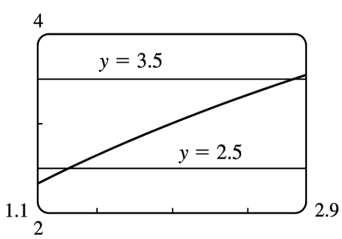
1. **(a)** To have $5x+3$ within a distance of 0.1 of 13 , we must have $12.9 \le 5x+3 \le 13.1 \Rightarrow$ $9.9 \le 5x \le 10.1 \Rightarrow 1.98 \le x \le 2.02$. Thus, x must be within 0.02 units of 2 so that $5x+3$ is within 0.1 of 13.
(b) Use 0.01 in place of 0.1 in part (a) to obtain 0.002.

3. On the left side of $x=2$, we need $|x-2| < \left| \frac{10}{7} - 2 \right| = \frac{4}{7}$. On the right side, we need $|x-2| < \left| \frac{10}{3} - 2 \right| = \frac{4}{3}$. For both of these conditions to be satisfied at once, we need the more restrictive of the two to hold, that is, $|x-2| < \frac{4}{7}$. So we can choose $\delta = \frac{4}{7}$, or any smaller positive number.

5. The leftmost question mark is the solution of $\sqrt{x} = 1.6$ and the rightmost, $\sqrt{x} = 2.4$. So the values are $1.6^2 = 2.56$ and $2.4^2 = 5.76$. On the left side, we need $|x-4| < |2.56-4| = 1.44$. On the right side, we need $|x-4| < |5.76-4| = 1.76$. To satisfy both conditions, we need the more restrictive condition to hold — namely, $|x-4| < 1.44$. Thus, we can choose $\delta = 1.44$, or any smaller positive number.

7. $\left| \sqrt{4x+1} - 3 \right| < 0.5 \Leftrightarrow 2.5 < \sqrt{4x+1} < 3.5$. We plot the three parts of this inequality on the same screen and identify the x –coordinates of the points of intersection using the cursor. It appears that the inequality holds for $1.3125 \le x \le 2.8125$. Since $|2-1.3125| = 0.6875$ and $|2-2.8125| = 0.8125$, we choose $0 < \delta < \min\{0.6875, 0.8125\} = 0.6875$.



13. **(a)** $A = \pi r^2$ and $A = 1000 \text{ cm}^2 \Rightarrow \pi r^2 = 1000 \Rightarrow r^2 = \frac{1000}{\pi} \Rightarrow$ $r = \sqrt{\frac{1000}{\pi}}$ $[r>0] \approx 17.8412$ cm.
(b) $|A - 1000| \le 5 \Rightarrow -5 \le \pi r^2 - 1000 \le 5 \Rightarrow 1000 - 5 \le \pi r^2 \le 1000 + 5 \Rightarrow$ $\sqrt{\frac{995}{\pi}} \le r \le \sqrt{\frac{1005}{\pi}} \Rightarrow 17.7966 \le r \le 17.8858$. $\sqrt{\frac{1000}{\pi}} - \sqrt{\frac{995}{\pi}} \approx 0.04466$ and $\sqrt{\frac{1005}{\pi}} - \sqrt{\frac{1000}{\pi}} \approx 0.04455$. So if the machinist gets the radius within 0.0445 cm of 17.8412 , the area will be within 5 cm

^{2} of 1000.

(c) x is the radius, $f(x)$ is the area, a is the target radius given in part (a), L is the target area (1000), ε is the tolerance in the area (5), and δ is the tolerance in the radius given in part (b).

41. $\frac{1}{(x+3)^4} > 10,000 \Leftrightarrow (x+3)^4 < \frac{1}{10,000} \Leftrightarrow |x+3| < \frac{1}{\sqrt[4]{10,000}} \Leftrightarrow |x-(-3)| < \frac{1}{10}$