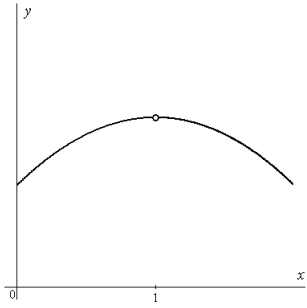
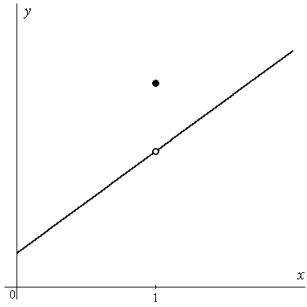
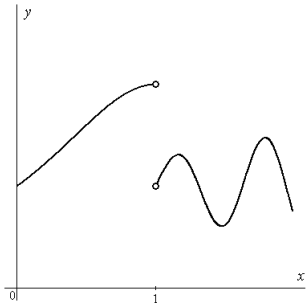
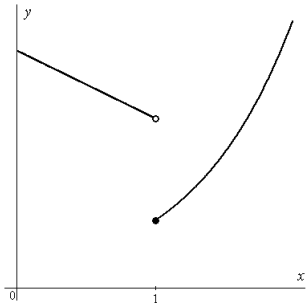
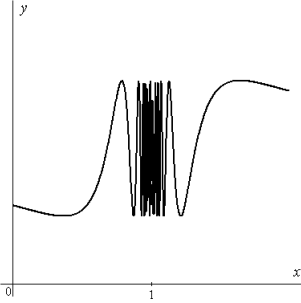
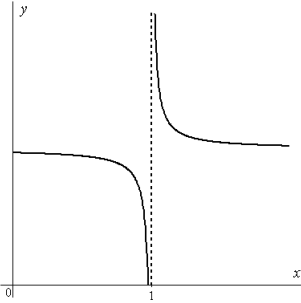
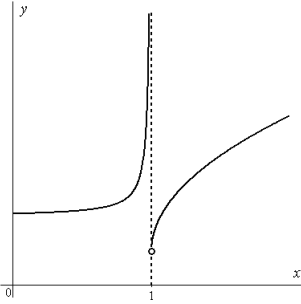
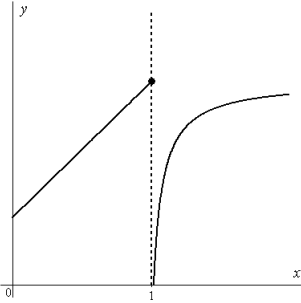
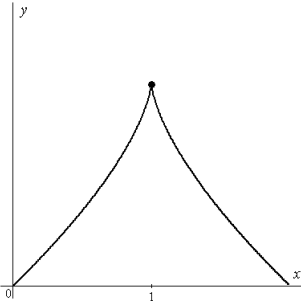


For a function to be *continuous* at a point $x = a$, the three following conditions must be met:

- $f(a)$ is defined
- $\lim_{x \rightarrow a} f(x)$ exists
- $f(a) = \lim_{x \rightarrow a} f(x)$

For each function shown below, describe the “point of interest” in its graph at $x = 1$. Determine if each function is continuous at $x = 1$. Explain your reasoning based on the three conditions listed in the definition above.

	<p>There is a hole (or “removable discontinuity”) in the graph.</p> <p>$f(x)$ is discontinuous at $x = 1$:</p> <ul style="list-style-type: none"> • $f(1)$ is undefined
	<p>There is a hole (or “removable discontinuity”) in the graph.</p> <p>$f(x)$ is discontinuous at $x = 1$:</p> <ul style="list-style-type: none"> • $f(1) \neq \lim_{x \rightarrow 1} f(x)$
	<p>There is a jump in the graph.</p> <p>$f(x)$ is discontinuous at $x = 1$:</p> <ul style="list-style-type: none"> • $f(1)$ is undefined • $\lim_{x \rightarrow 1} f(x)$ does not exist (since the one-sided limits are not equal)
	<p>There is a jump in the graph.</p> <p>$f(x)$ is discontinuous at $x = 1$:</p> <ul style="list-style-type: none"> • $\lim_{x \rightarrow 1} f(x)$ does not exist (since the one-sided limits are not equal)

 <p>A graph on a coordinate plane with x and y axes. The x-axis has a tick mark at 1. The function oscillates increasingly rapidly as it approaches x=1, with the amplitude of the oscillations increasing without bound. For x > 1, the function is a smooth curve that starts from a point at x=1 and increases.</p>	<p>There is an infinite oscillation in the graph.</p> <p>$f(x)$ is discontinuous at $x = 1$:</p> <ul style="list-style-type: none"> • $f(1)$ is undefined • $\lim_{x \rightarrow 1} f(x)$ does not exist (since there is an infinite oscillation)
 <p>A graph on a coordinate plane with x and y axes. The x-axis has a tick mark at 1. A vertical dashed line is drawn at x=1, representing a vertical asymptote. The function approaches negative infinity as x approaches 1 from the left and positive infinity as x approaches 1 from the right. For x < 1, the function is a smooth curve that increases towards the asymptote. For x > 1, the function is a smooth curve that decreases away from the asymptote.</p>	<p>There is a vertical asymptote in the graph.</p> <p>$f(x)$ is discontinuous at $x = 1$:</p> <ul style="list-style-type: none"> • $f(1)$ is undefined • $\lim_{x \rightarrow 1} f(x)$ does not exist (since either one-sided limit is unbounded)
 <p>A graph on a coordinate plane with x and y axes. The x-axis has a tick mark at 1. A vertical dashed line is drawn at x=1, representing a vertical asymptote. The function approaches positive infinity as x approaches 1 from the left. At x=1, there is an open circle on the x-axis. The function then starts at this open circle and increases smoothly for x > 1.</p>	<p>There is a vertical asymptote in the graph.</p> <p>$f(x)$ is discontinuous at $x = 1$:</p> <ul style="list-style-type: none"> • $f(1)$ is undefined • $\lim_{x \rightarrow 1} f(x)$ does not exist (since the left one-sided limit is unbounded)
 <p>A graph on a coordinate plane with x and y axes. The x-axis has a tick mark at 1. A vertical dashed line is drawn at x=1, representing a vertical asymptote. The function increases linearly towards the asymptote from the left. At x=1, there is a closed circle at a positive y-value. The function then starts at this closed circle and increases smoothly for x > 1.</p>	<p>There is a vertical asymptote in the graph.</p> <p>$f(x)$ is discontinuous at $x = 1$:</p> <ul style="list-style-type: none"> • $\lim_{x \rightarrow 1} f(x)$ does not exist (since the right one-sided limit is unbounded)
 <p>A graph on a coordinate plane with x and y axes. The x-axis has a tick mark at 1. The function is a smooth curve that increases from the origin to a sharp peak at x=1, and then decreases smoothly. There is a closed circle at the peak.</p>	<p>There is a “cusp” in the graph.</p> <p>$f(x)$ is continuous at $x = 1$:</p> <ul style="list-style-type: none"> • $f(1) = \lim_{x \rightarrow 1} f(x)$