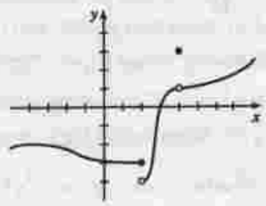
2.4

2. The graph of f has no hole, jump, or vertical asymptote.

4. g is continuous on $[-4, -2)$, $(-2, 2)$, $[2, 4)$, $(4, 6)$, and $(6, 8)$.

6.



8. (a) Continuous; at the location in question, the temperature changes smoothly as time passes, without any instantaneous jumps from one temperature to another.

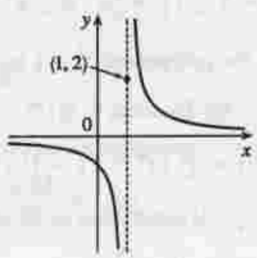
(b) Continuous; the temperature at a specific time changes smoothly as the distance due west from New York City increases, without any instantaneous jumps.

(c) Discontinuous; as the distance due west from New York City increases, the altitude above sea level may jump from one height to another without going through all of the intermediate values — at a cliff, for example.

(d) Discontinuous; as the distance traveled increases, the cost of the ride jumps in small increments.

(e) Discontinuous; when the lights are switched on (or off), the current suddenly changes between 0 and some nonzero value, without passing through all of the intermediate values. This is debatable, though, depending on your definition of current.

14. $f(x) = \begin{cases} 1/(x-1) & \text{if } x \neq 1 \\ 2 & \text{if } x = 1 \end{cases}$ is discontinuous at 1 because $\lim_{x \to 1} f(x)$ does not exist.



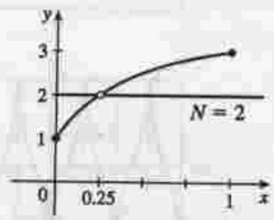
20. By Theorem 5, the polynomial $x^2 - 1$ is continuous on $(-\infty, \infty)$. By Theorem 7, $\sin^{-1}$ is continuous on its domain, $[-1, 1]$. By Theorem 9, $\sin^{-1}(x^2 - 1)$ is continuous on its domain, which is

$\{x \mid -1 \leq x^2 - 1 \leq 1\} = \{x \mid 0 \leq x^2 \leq 2\} = \{x \mid |x| \leq \sqrt{2}\} = [-\sqrt{2}, \sqrt{2}]$.

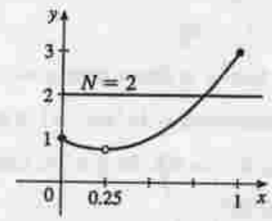
30. By Theorem 5, each piece of F is continuous on its domain. We need to check for continuity at $r = R$.

$\lim_{r \to R^-} F(r) = \lim_{r \to R^-} \frac{GMr}{R^3} = \frac{GM}{R^2}$ and $\lim_{r \to R^+} F(r) = \lim_{r \to R^+} \frac{GM}{r^2} = \frac{GM}{R^2}$, so $\lim_{r \to R} F(r) = \frac{GM}{R^2}$. Since $F(R) = \frac{GM}{R^2}$, F is continuous at R. Therefore, F is a continuous function of r.

32.



f does not satisfy the conclusion of the Intermediate Value Theorem.



f does satisfy the conclusion of the Intermediate Value Theorem.