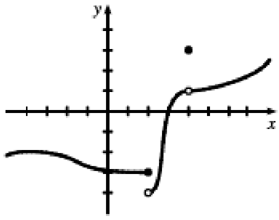
4. g is continuous on $[-4,-2)$, $(-2,2)$, $[2,4)$, $(4,6)$, and $(6,8)$.

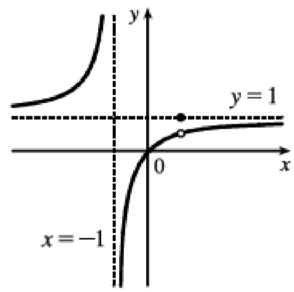
6.



10. $\lim\limits_{x\to 4} f(x) = \lim\limits_{x\to 4}\left(x^2+\sqrt{7-x}\right) = \lim\limits_{x\to 4} x^2 + \sqrt{\lim\limits_{x\to 4} 7 - \lim\limits_{x\to 4} x} = 4^2+\sqrt{7-4} = 16+\sqrt{3} = f(4)$.

By the definition of continuity, f is continuous at $a=4$.

16. $f(x) = \begin{cases} \dfrac{x^2-x}{x^2-1} & \text{if } x \neq 1 \\ 1 & \text{if } x = 1 \end{cases}$



$\lim\limits_{x\to 1} f(x) = \lim\limits_{x\to 1} \dfrac{x^2-x}{x^2-1} = \lim\limits_{x\to 1} \dfrac{x(x-1)}{(x+1)(x-1)} = \lim\limits_{x\to 1} \dfrac{x}{x+1} = \dfrac{1}{2}$,

but $f(1)=1$, so f is discontinous at 1.

19. By Theorem 5, the polynomials x^2 and $2x-1$ are continuous on $(-\infty,\infty)$. By Theorem 7, the root function $\sqrt{x}$ is continuous on $[0,\infty)$. By Theorem 9, the composite function $\sqrt{2x-1}$ is continuous on its domain, $[\frac{1}{2},\infty)$. By part 1 of Theorem 4, the sum $R(x) = x^2+\sqrt{2x-1}$ is continuous on $[\frac{1}{2},\infty)$.

25. Because we are dealing with root functions, $5+\sqrt{x}$ is continuous on $[0,\infty)$, $\sqrt{x+5}$ is continuous on $[-5,\infty)$, so the quotient $f(x) = \dfrac{5+\sqrt{x}}{\sqrt{5+x}}$ is continuous on $[0,\infty)$. Since f is continuous at $x=4$, $\lim\limits_{x\to 4} f(x) = f(4) = \frac{7}{3}$.

26. Because x is continuous on $\mathbb{R}$, $\sin x$ is continuous on $\mathbb{R}$, and $x+\sin x$ is continuous on $\mathbb{R}$, the composite function $f(x) = \sin(x+\sin x)$ is continuous on $\mathbb{R}$, so $\lim\limits_{x\to\pi} f(x) = f(\pi) = \sin(\pi+\sin\pi) = \sin\pi = 0$.

29. $f(x) = \begin{cases} x^2 & \text{if } x < 1 \\ \sqrt{x} & \text{if } x \geq 1 \end{cases}$

By Theorem 5, since $f(x)$ equals the polynomial x^2 on $(-\infty,1)$, f is continuous on $(-\infty,1)$. By Theorem 7, since $f(x)$ equals the root function $\sqrt{x}$ on $(1,\infty)$, f is continuous on $(1,\infty)$. At $x=1$, $\lim\limits_{x\to 1^-} f(x) = \lim\limits_{x\to 1^-} x^2 = 1$ and $\lim\limits_{x\to 1^+} f(x) = \lim\limits_{x\to 1^+} \sqrt{x} = 1$. Thus, $\lim\limits_{x\to 1} f(x)$ exists and equals 1. Also, $f(1) = \sqrt{1} = 1$. Thus, f is continuous at $x=1$. We conclude that f is continuous on $(-\infty,\infty)$.