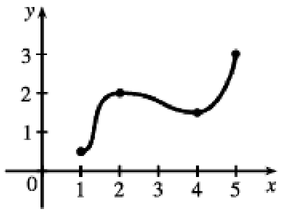
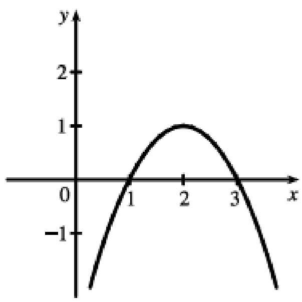
4. Absolute maximum at e; absolute minimum at t; local maxima at c, e, and s; local minima at b, c, d, and r; neither a maximum nor a minimum at a.

6. Absolute maximum value is $f(7) = 5$; absolute minimum value is $f(1) = 0$; local maximum values are $f(0) = 2$, $f(3) = 4$, and $f(5) = 3$; local minimum values are $f(1) = 0$, $f(4) = 2$, and $f(6) = 1$.

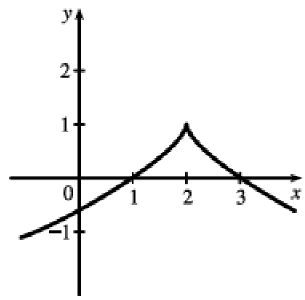
8. Absolute minimum at 1, absolute maximum at 5,
local maximum at 2, local minimum at 4



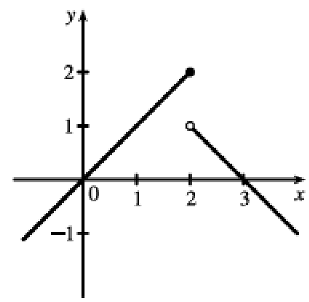
11. (a)



(b)



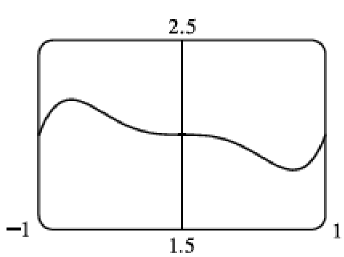
(c)



26. $f(x) = x^3 + x^2 + x \quad \Rightarrow \quad f'(x) = 3x^2 + 2x + 1.\quad f'(x) = 0 \quad \Rightarrow \quad 3x^2 + 2x + 1 = 0 \quad \Rightarrow \quad x = \dfrac{-2 \pm \sqrt{4 - 12}}{6}$.
Neither of these is a real number. Thus, there are no critical numbers.

39. $f(x) = 2x^3 - 3x^2 - 12x + 1,\ [-2, 3].\quad f'(x) = 6x^2 - 6x - 12 = 6(x^2 - x - 2) = 6(x - 2)(x + 1) = 0 \quad \Leftrightarrow$ $x = 2, -1.\quad f(-2) = -3$, $f(-1) = 8$, $f(2) = -19$, and $f(3) = -8$. So $f(-1) = 8$ is the absolute maximum value and $f(2) = -19$ is the absolute minimum value.

51. (a)



From the graph, it appears that the absolute maximum value is about $f(-0.77) = 2.19$, and the absolute minimum value is about $f(0.77) = 1.81$.

(b) $f(x) = x^5 - x^3 + 2 \quad \Rightarrow \quad f'(x) = 5x^4 - 3x^2 = x^2(5x^2 - 3)$. So $f'(x) = 0 \quad \Rightarrow \quad x = 0, \pm\sqrt{\frac{3}{5}}$.

$f\left(-\sqrt{\frac{3}{5}}\right) = \left(-\sqrt{\frac{3}{5}}\right)^5 - \left(-\sqrt{\frac{3}{5}}\right)^3 + 2 = -\left(\frac{3}{5}\right)^2\sqrt{\frac{3}{5}} + \frac{3}{5}\sqrt{\frac{3}{5}} + 2 = \left(\frac{3}{5} - \frac{9}{25}\right)\sqrt{\frac{3}{5}} + 2 = \frac{6}{25}\sqrt{\frac{3}{5}} + 2$ (maximum)
and similarly, $f\left(\sqrt{\frac{3}{5}}\right) = -\frac{6}{25}\sqrt{\frac{3}{5}} + 2$ (minimum).