41. (a) $s = t^3 - 3t \Rightarrow v(t) = s'(t) = 3t^2 - 3 \Rightarrow a(t) = v'(t) = 6t$

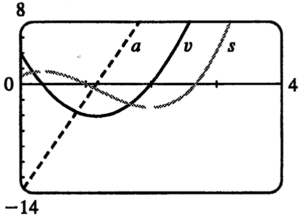
(b) $a(2) = 6(2) = 12\text{ m/s}^2$

(c) $v(t) = 3t^2 - 3 = 0$ when $t^2 = 1$, that is, $t = 1$ and $a(1) = 6\text{ m/s}^2$.

42. (a) $s = 2t^3 - 7t^2 + 4t + 1 \Rightarrow v(t) = s'(t) = 6t^2 - 14t + 4 \Rightarrow a(t) = v'(t) = 12t - 14$

(b) $a(1) = 12 - 14 = -2\text{ m/s}^2$

(c)



43. $f(x) = 1 + 2e^x - 3x \Rightarrow f'(x) = 2e^x - 3$. $f'(x) > 0 \Rightarrow 2e^x - 3 > 0 \Rightarrow 2e^x > 3 \Rightarrow e^x > 1.5 \Rightarrow x > \ln 1.5 \approx 0.41$. f is increasing when f' is positive; that is, on $(\ln 1.5, \infty)$.

44. $f(x) = x^3 - 4x^2 + 5x \Rightarrow f'(x) = 3x^2 - 8x + 5 \Rightarrow f''(x) = 6x - 8$. $f''(x) > 0 \Rightarrow 6x - 8 > 0 \Rightarrow x > \frac{4}{3}$. f is concave upward when $f''(x) > 0$; that is, on $\left(\frac{4}{3}, \infty\right)$.

45. $y = x^3 - x^2 - x + 1$ has a horizontal tangent when $y' = 3x^2 - 2x - 1 = 0$. $(3x+1)(x-1) = 0 \Leftrightarrow x = 1$ or $-\frac{1}{3}$. Therefore, the points are $(1, 0)$ and $\left(-\frac{1}{3}, \frac{32}{27}\right)$.

46. $f(x) = 2x^3 - 3x^2 - 6x + 87$ has a horizontal tangent when $f'(x) = 6x^2 - 6x - 6 = 0 \Leftrightarrow x^2 - x - 1 = 0 \Leftrightarrow x = \frac{1 \pm \sqrt{5}}{2}$.

47. $y = 6x^3 + 5x - 3 \Rightarrow m = y' = 18x^2 + 5$, but $x^2 \geq 0$ for all x, so $m \geq 5$ for all x.