3. $f(x) = 186.5$ is a constant function, so its derivative is 0, that is, $f'(x) = 0$.

6. $F(x) = \frac{3}{4}x^8 \quad \Rightarrow \quad F'(x) = \frac{3}{4}(8x^7) = 6x^7$

12. $y = 5e^x + 3 \quad \Rightarrow \quad y' = 5(e^x) + 0 = 5e^x$

15. $A(s) = -\dfrac{12}{s^5} = -12s^{-5} \quad \Rightarrow \quad A'(s) = -12(-5s^{-6}) = 60s^{-6}$ or $60/s^6$

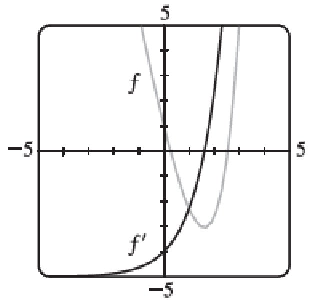
18. $y = \sqrt[3]{x} = x^{1/3} \quad \Rightarrow \quad y' = \frac{1}{3}x^{-2/3} = \dfrac{1}{3x^{2/3}}$

21. $y = ax^2 + bx + c \quad \Rightarrow \quad y' = 2ax + b$

24. $y = \dfrac{x^2 - 2\sqrt{x}}{x} = x - 2x^{-1/2} \quad \Rightarrow \quad y' = 1 - 2\left(-\frac{1}{2}\right)x^{-3/2} = 1 + \dfrac{1}{x\sqrt{x}}$

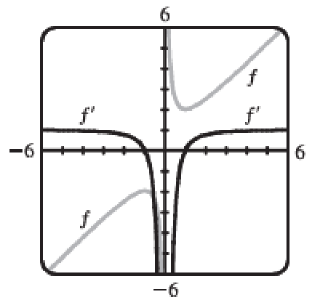
39. $f(x) = e^x - 5x \quad \Rightarrow \quad f'(x) = e^x - 5.$

Notice that $f'(x) = 0$ when f has a horizontal tangent, f' is positive when f is increasing, and f' is negative when f is decreasing.



42. $f(x) = x + 1/x = x + x^{-1} \quad \Rightarrow \quad f'(x) = 1 - x^{-2} = 1 - 1/x^2.$

Notice that $f'(x) = 0$ when f has a horizontal tangent, f' is positive when f is increasing, and f' is negative when f is decreasing.



45. $f(x) = x^4 - 3x^3 + 16x \quad \Rightarrow \quad f'(x) = 4x^3 - 9x^2 + 16 \quad \Rightarrow \quad f''(x) = 12x^2 - 18x$

52. $f(x) = x^3 + 3x^2 + x + 3$ has a horizontal tangent when $f'(x) = 3x^2 + 6x + 1 = 0 \quad \Leftrightarrow$

$x = \dfrac{-6 \pm \sqrt{36 - 12}}{6} = -1 \pm \frac{1}{3}\sqrt{6}.$