Find $\frac{d^2y}{dx^2}$.

$y = \sqrt[3]{x}$

$$\frac{dy}{dx} = \frac{1}{3}x^{-\frac{2}{3}}$$

$$\frac{d^2y}{dx^2} = -\frac{2}{9}x^{-\frac{5}{3}}$$

Find y''.

$y = (x^7 + x)^{6/7}$

$y' = \frac{6}{7}(x^7+x)^{-\frac{1}{7}}(7x^6+1)$

$y'' = \frac{6}{7}(x^7+x)^{-\frac{1}{7}}(42x^5) + (7x^6+1)\left[\frac{-6}{49}(x^7+x)^{-8/7}(7x^6+1)\right]$

$= 36x^5(x^7+x)^{-\frac{1}{7}} + (7x^6+1)^2(x^7+x)^{-8/7}\left(\frac{-6}{49}\right)$

$= (x^7+x)^{-8/7}\left[36x^5(x^7+x) - \frac{6}{49}(7x^6+1)^2\right]$

$= (x^7+x)^{-8/7}\left[36x^{12}+36x^6 - \frac{6}{49}(49x^{12}+14x^6+1)\right]$

$= (x^7+x)^{-8/7}\left(36x^{12}+36x^6 - 6x^{12} - \frac{12}{7}x^6 - \frac{6}{49}\right)$

$= (x^7+x)^{-8/7}\left(30x^{12} + \frac{240}{7}x^6 - \frac{6}{49}\right)$

$= \frac{30x^{12} + \frac{240}{7}x^6 - \frac{6}{49}}{(x^7+x)^{8/7}} \cdot \frac{49}{49}$

$= \frac{1470x^{12} + 1680x^6 - 6}{49(x^7+x)^{8/7}}$

When an object is dropped on a certain earth-like planet, the distance it falls in t seconds, assuming that air resistance is negligible, is given by

$s(t) = 14t^2$

where s(t) is in feet. Suppose that a medic's reflex hammer is dropped from a hovering helicopter. Find **(a)** how far the hammer falls in 2 sec, **(b)** how fast the hammer is traveling 2 sec after being dropped, and **(c)** the hammer's acceleration after it has been falling for 2 sec.

$$s(2) = 14(2)^2 = 56\,ft$$

$$v(t) = s'(t) = 28t$$
$$v(2) - 56\,ft/\sec$$

$$a(t) = v'(t) = s''(t) = 28$$
$$a(2) = 28\,ft/\sec^2$$