1. $f'(x) = 4x^3 + 21x^2 - 4x - 4$,

2. $g'(x) = 6x - 3 + 6x^{-4}$,

3. $h'(t) = 3t^2 - 5 + 2t^{-3}$,

4. $k'(z) = 3z + 6 - \frac{1}{2}z^{-\frac{1}{2}}$,

5. $p'(z) = \frac{1}{3}z^{-\frac{2}{3}} + 9.4z - \frac{35}{2}z^{\frac{3}{2}}$,

6. $q'(w) = -1.2w^{-1.4} + 10.5w^4 + w^{-\frac{3}{2}}$,

7. $f'(x) = 2ax + b$,

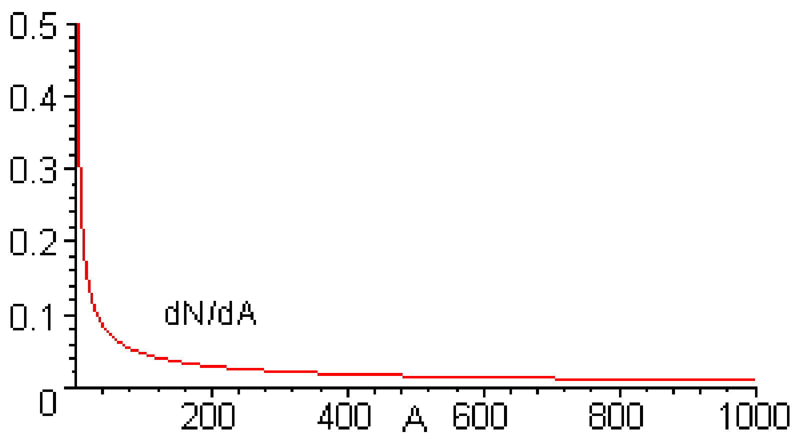
8. $g'(x) = 3Bx^{-4} - \frac{C}{2}x^{-\frac{3}{2}} - 4Dx^3$.

9. a. $dh/da = h'(a) = 6.46$ cm/yr, which is constant. The growth rate is 6.46 cm/yr at all ages, including ages 2 and 6.

b. The predicted height at age 11 is 141.46 cm.

10. a. $dN/dA = N'(A) = A^{-\frac{2}{3}}$, so $N'(64) = \frac{1}{16}$, $N'(125) = \frac{1}{25}$, and $N'(1000) = \frac{1}{100}$.

b. Below is a graph of the derivative for $0 \leq A \leq 1000$.

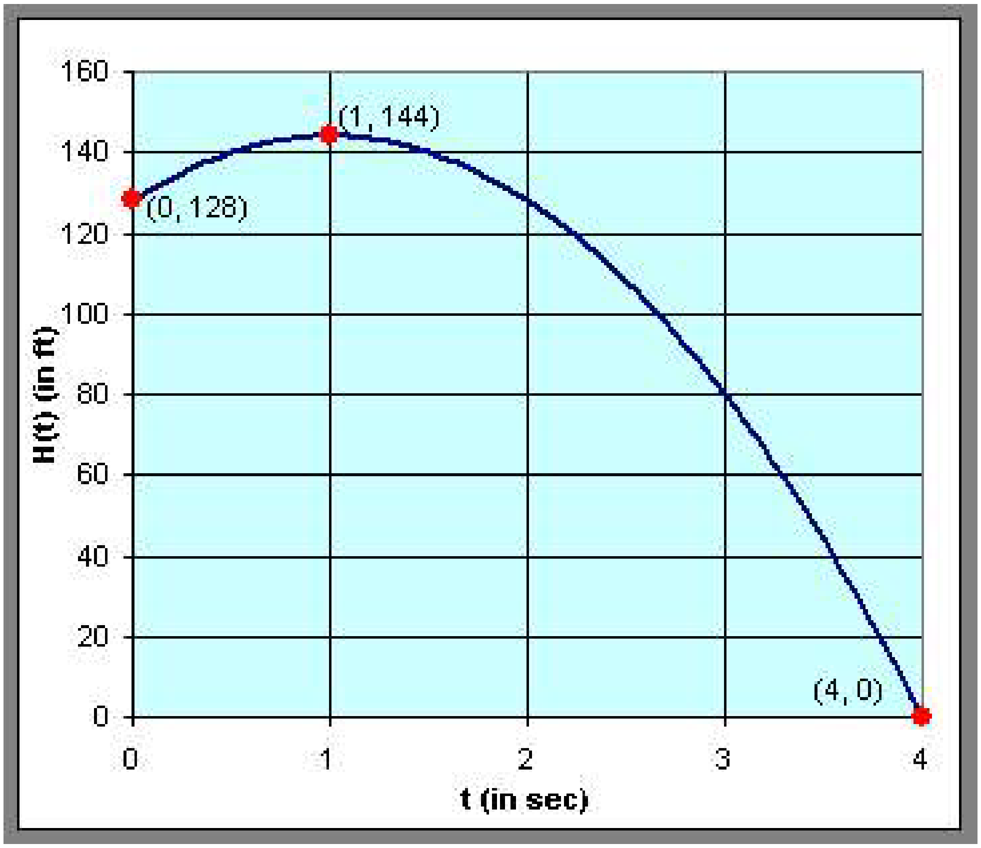


11. a. $v(t) = y'(t) = -9.8t$.

b. $v(1) = -9.8$ m/sec and $v(5) = -49$ m/sec.

12. a. $v(t) = h'(t) = 32 - 32t$, so $v(t) = 0$ implies $t = 1$ with $h(1) = 144$ ft, the maximum height of the ball. $v(2) = -32$ ft/sec and $v(4) = -96$ ft/sec.

b. Below is a graph of $h(t)$.



13. a. The velocity is $v(t) = h'(t) = -32t + v_0$.

b. The velocity is zero when $t_m = v_0/32$.

c. The initial velocity needs to be $v_0 = 16$ ft/sec, so $v(t) = -32t + 16$. The velocity at $t = 1$ sec is $v(1) = -16$ ft/sec.

d. The cat hits the ground at $t = \frac{3}{2}$ sec with a velocity of $v(1.5) = -32$ ft/sec.

14. a. The rate of change of body temperature is

$$T'(t) = -0.03t^2 + 0.57t - 1.8.$$

b. At midnight, $T'(0) = -1.8$ °/hr. At 4 AM, $T'(4) = 0$ °/hr. At 8 AM, $T'(8) = 0.84$ °/hr. At noon, $T'(12) = 0.72$ °/hr. At 4 PM, $T'(16) = -0.36$ °/hr. The fastest increase in body temperature is at 8 AM, while the most rapid cooling is at midnight (of the given times).