① $f(x) = 12x^3 - 30x^2 + 10x - 6$
$F(x) = 3x^4 - 10x^3 + 5x^2 - 6x$

② $f(x) = \frac{7 - 6x^4}{x^2}; \; 7x^{-2} - 6x^2$
$F(x) = -7x^{-1} - 2x^3 + C$

③ $\frac{dy}{dx} = 8e^x + 7$
$f(x): \text{antider} = 8e^x + 7x + C$

④ $f(x) = 7x^{1/2} + 3x^{-1/2}$
$F(x) = \frac{14}{3}x^{3/2} + 6x^{1/2} + C$

⑤ $\frac{dy}{du} = 2t^{-1} + 5$
$x(t) = 2\ln|t| + 5t + C$

⑥ $p'(x) = \frac{-50}{x^2}; \; p(4) = 7$
$p(x) = \frac{50}{x}; \; \frac{50}{4} + C = 7; \; C = -\frac{11}{2}$
$p(x) = \frac{50}{x} - \frac{11}{2} + f(x)$

⑦ $f(x) = x^2 + \sin x; \; F(\pi) = 0$
$F(x) = \frac{x^3}{3} - \cos x + C; \; \frac{\pi^3}{3} + 1 + C = 0$
$F(x) = \frac{x^3}{3} - \cos x - \frac{\pi^3}{3} - 1$

⑨ $f'' = 10x + 3\sin x; \; f'(0) = 4; \; f(0) = 4$
$f'(x) = 5x^2 - 3\cos x + C; \; f'(0) = -3 + C = 4$
$f'(x) = 5x^2 - 3\cos x + 7$
$f(x) = \frac{5x^3}{3} - 3\sin x + 7x + C; \; f(0) = 4$
$f(x) = \frac{5x^3}{3} - 3\sin x + 7x + 4$

⑩ $f'''(x) = e^x; \; f''(0) = 7; \; f'(0) = 7$
$f''(x) = e^x + C; \; f''(0) = 1 + C = 7; \; f''(x) = e^x + 6$
$f' = e^x + 6x + C; \; f'(0) = 1 + C = 7$
$f'(x) = e^x + 6x + 6; \; f(x) = e^x + 3x^2 + 6x + C$

⑪ $f(x): (10, 5) \Rightarrow \text{tangent } 5x + 4$
$f'(x) = 5x + 4; \; f(x) = \frac{5}{2}x^2 + 4x + C$
$f(10) = \frac{5}{2}(100) + 40 + C = 5; \; C = -285$
$f(x) = \frac{5}{2}x^2 + 4x - 285; \; f(3) = -2505$

⑫ $w''(t) = -g; \; w'(0) = N; \; w(0) = H$
$w'(t) = -gt + N; \; w(t) = \frac{-gt^2}{2} + Nt + H$
$w(t) = \frac{-gt^2}{2} + Nt + H$

⑬ $N_0 = 50; \; a = -7; \; N(t) = -7t + 50$
$s(t) = \frac{-7t^2}{2} + 50t = 0; \; N(\frac{50}{7}) = 0 \uparrow$
$s(\frac{50}{7}) = \frac{-7}{2}(\frac{50}{7})^2 + 50(\frac{50}{7}) = 178.57 \, \text{ft}$

Homework 4-9:

(14) $S(0) = 650; \ V(0) = 20$

   (a) $\vec{a} = -32; \ V(t) = -32t + 20$

     $S(t) = -16t^2 + 20t + 650$

     $S(4) = 474$

   (b) $-16t^2 + 20t + 650 = 0$

         calculated using quad

     $t = \left\{ \dfrac{\pm 5\sqrt{105} + 5}{8} \right\}$

     hits ground at ≈ 7.029 sec

   (c) $V(7.029) = -32(7.029) + 20$

         $\approx -204.928 \ \dfrac{ft}{s}$

(8) $f(x) = \dfrac{60}{(4x - 17)^2}; \ 60\displaystyle\int \dfrac{1}{(4x-17)^2} dx$

   $F(x) = \dfrac{-60}{4(4x-17)} = \dfrac{-15}{4x-17} + C$

   $F(5) = -5 + C = 0; \ C = 5; \ F(x) = \dfrac{-15}{4x-17} + 5$