Examples from Chapter 2!

• Suppose $x(t) = A + Bt^2 + Ct^3$, where $A,\ B$ and C are constants. What is $v_x(t)$?

• Suppose $x(t) = x(0)\exp(bt)$ where b is a constant. What is $v_x(t)$?

• Suppose $x(t) = A + Bt^2 + Ct^3$, where $A,\ B$ and C are constants. What is $a_x(t)$?

• A particle starts from $x(0) = 0$ with $v_x(0) = 0$, at constant a_x. In 10 sec it is travelling at 100 m/s. What is a_x and what is $x(10\text{ sec})$? At this moment, the particle's acceleration instantaneously changes from a constant positive value to a constant negative value, and the particle comes to rest after travelling 100 more meters. What is the new value of a_x?

• A ball near the earth's surface is thrown upward at 100 m/s. How high does it go? With what velocity does it arrive back at its starting point?

• Ball 1 is thrown downward toward the ground a distance D below at $v(0)$. At the same instant, ball 2 is thrown upward from ground level on the same vertical line, at $v(0)$. Show that the balls will collide at

$$y = \frac{D}{2}\Big[1 - \frac{gD}{4v_0^2}\Big].$$

• Suppose a particle follows the path $x(t) = x(0) - b_1t^2 + b_2t^3$, where constants b_1 and b_2 are both positive. At what $t > 0$ is the particle closest to $x = 0$ and what is its position at that time?

Solution: $x_{\min} = x(0) - 0.148(b_1^3/b_2^2)$.