DLI Physics **Mechanics Problem Set 1** **Applied Derivatives in Mechanics**

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1. A honeycrisp apple moves in a straight line with its position, x, given by the following equation:
$x(t) = t^4 - 4t^3 - 2t^2 - 3t - 6$

a. Find its position after 1 second.
b. Find its velocity after 2 seconds.
c. Find its acceleration after 3 seconds.
d. What is the rate of change of the acceleration at 1 second.
e. Use Python to graph the position, velocity and acceleration as functions of time from t=0 to t=4 seconds.
f. Use Python to graph the rate of change of acceleration vs. time.

$X(t) = t^4 - 4t^3 + 2t^2 + 3t + 6$

a. $1 - 4 + 2 + 3 + 6$

$= -4 + 12 = 8\ m$

v=

b $d'(x) = 4t^3 - 12t^2 + 4t + 3$

$d'(2) = (4)(8) - (12)(4) + (4)(2) + 3$

$= 32 - 48 + 8 + 3$

$= -5\ m/s$

a=

c. $d''(x) = 12t^2 - 24t + 4$

$d''(3) = (12)(9) - (24)(3) + 4$

$= 108 - 72 + 4$

$= 40\ m/s^2$

d. $d'''(x) = 24t - 24$

$d'''(1) = (24)(1) - 24$

$= 0$