Notes:

Find a and b to make the function differentiable: (similar to #447)

$$f(x) = \begin{cases} x^2 - 2x + 1, & x <= -2 \\ ax + b, & x > -2 \end{cases}$$

Cont'd: $\lim_{x \to -2^-} f(x) = f(-2) = \lim_{x \to -2^+} f(x)$

System

$$\begin{cases} -2a + b = 9 \\ a = -6 \end{cases}$$

$(-2)^2 - 2(-2) + 1$

$4 + 4 + 1$

$9 = 9 = -2a + b$

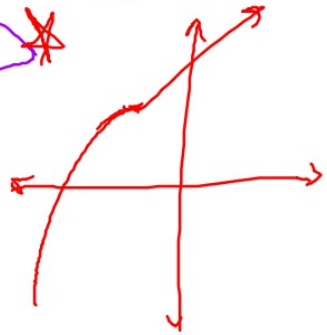
* f' must be cont. also *

$$f'(x) = \begin{cases} 2x - 2, & x \leq -2 \\ a, & x > -2 \end{cases}$$

$2(-2) - 2 = -6 = a$

$\Rightarrow -2(-6) + b = 9$

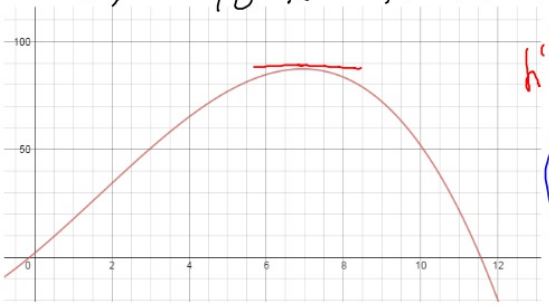
$b = 3$



Units

Let $h(t)$ be a function that models the height in meters of a rocket after t secs.

$h(t) = -\frac{2}{10}x^3 + x^2 + 15x + 2$ meters



$h'(t) = \frac{dh}{dt} = -\frac{3}{5}t^2 + 2t + 15$ $\frac{m}{sec}$

* The first derivative of a position function is the velocity function *

Physics: Velocity tells speed AND direction (vector quantity)

$h''(t) = \frac{d^2h}{dt^2} = -\frac{6}{5}t + 2$ m/s /s or m/s^2 ← acceleration

2nd derivative

Hierarchy:

h(t)	position function (measured in distance)
	take d/dt....
	↓
h'(t)=v(t)	velocity function (measured in distance/time)
	take d/dt....
	↓
h"(t)=v'(t)=a(t)	acceleration function (measured in distance/time^2)