

3.1 25)

$$f(x) = (x-1)^6$$

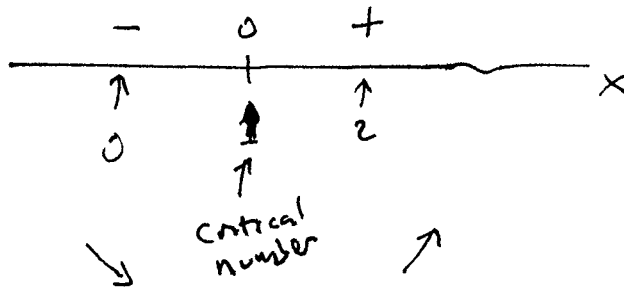
$$f'(x) = 6(x-1)^5 \cdot \frac{d}{dx}[x-1]$$

$$0 = f'(x) = 6(x-1)^5 \Rightarrow 0 = (x-1)^5$$

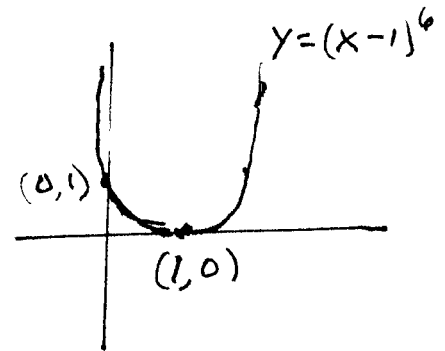
$$= (x-1)(x-1) \cdots (x-1)$$

$$\Rightarrow x-1 = 0$$

$x = 1$  is the only critical number.

sgn of  $f'(x)$ 

increases



[see <sup>earlier</sup> notes on implicit differentiation and related rates]

### §3.6 A related rates example

p 228 64)

$T$  = number of traffic accidents

$p$  = population of a city

$t$  = time (years)

Given:  $\frac{dp}{dt} = 500$  people/year

eqn 1

$$T = 0.002 p^{3/2}$$

what is  $\frac{dT}{dt}$  when  $p = 40,000$ ?

$$\frac{dT}{dt} = \frac{d}{dt}[0.002 p^{3/2}]$$

$$\frac{dT}{dt} = 0.002 \cdot \frac{3}{2} p^{1/2} \cdot \frac{dp}{dt} \Rightarrow \frac{dT}{dt} = 0.003 p^{1/2} \frac{dp}{dt} \quad \leftarrow \text{eqn 2} \quad (\text{chain rule})$$

$$\frac{dT}{dt} = 0.003 (40,000)^{1/2} \cdot (500) = 0.003 (200)(500)$$

$$= 300 \text{ accidents/yr}$$