

Basic Derivative Rules

2.2A – Power Rule Applications

Meat

#1) The temperature of a steak is $f(x) = x^2 - 2x + 25$ degrees after x minutes on the grill (for $0 \leq x \leq 12$).

- Find the instantaneous rate of change in the temperature with respect to time
- Find $f'(2)$ and interpret your answer.
- Find the instantaneous rate of change of the temperature after 5 minutes. Interpret answer.

$f(x) = \text{degrees}$	$x = \text{minute}$	$\frac{\Delta f}{\Delta x} = \text{ }^\circ/\text{minute}$
-------------------------	---------------------	--

a. $f'(x) = 2x - 2$

b. $f'(2) = 2(2) - 2$
 $= 4 - 2$
 $= 2^\circ/\text{minute}$

After 2 minutes on the grill, the temperature of the steak is increasing by 2 degrees per minute.

c. $f'(5) = 2(5) - 2$
 $= 10 - 2$
 $= 8^\circ/\text{min}$

After 5 minutes on the grill, the temperature of the steak is increasing by 8 degrees per minute.

Pokémon

#2) In a Nintendo experiment, a Pocket Monster trainer can memorize Pokémon, $P(x) = 2x^2 - x$ in x seconds (for the first 10 seconds).

- Find $P'(x)$
- Find $P'(4)$ and interpret it as an instantaneous rate of change using proper units.

$P(x) = \text{ }^\circ \text{ f } \text{Pokémon}$	$x = \text{seconds}$	$\frac{\Delta P}{\Delta x} = \frac{\text{Pokémon}}{\text{second}}$
---	----------------------	--

a. $\frac{\Delta P}{\Delta x} = 4x - 1$

b. $P'(4) = 4(4) - 1$
 $= 16 - 1$
 $= 15 \text{ Pokémon}/\text{Sec}$

At 4 seconds a Pokémon trainer is memorizing Pokémon at a rate of 15 Pokémon per second.

OR

At 4 seconds the total Pokémon memorized is increasing by 15 Pokémon per second.

Basic Derivative Rules

2.2A – Power Rule Applications

Ewok Village

- #3) The function $E(x) = -2x^2 + 30x + 250$ is the population of Ewoks x weeks after a Stormtrooper invasion (for the first 20 weeks after the invasion.)
- Find the instantaneous rate of change of the Ewok population with respect to time in weeks.
 - Find the instantaneous rate of change of the population after 2 weeks. Interpret answer.
 - Find and interpret the meaning of $E'(10)$.

$$E(x) = \text{Ewok pop} \quad x = \text{weeks} \quad E'(x) = \text{Ewok/week}$$

a. $E'(x) = -4x + 30$

b. $E'(2) = -4(2) + 30$
 $= -8 + 30$
 $E'(2) = 22 \text{ Ewoks/week}$

Two weeks after a Stormtrooper invasion, the Ewok population is increasing by 22 Ewoks per week.

c. $E'(10) = -4(10) + 30$
 $= -40 + 30$
 $E'(10) = -10 \text{ Ewoks/week}$

Ten weeks after a Stormtrooper invasion, the Ewok population is decreasing by 10 Ewoks per week.

The Juice

- #4) The Ginzu Knife Company finds that the number of Knives that it sells on day x of an advertising campaign starring OJ Simpson is $K(x) = -x^2 + 15x$ for the first 12 days of advertising.
- Find $K'(x)$
 - Find the instantaneous rate of change on day 4. Interpret your answer.
 - Find $K'(10)$ and interpret your answer.

$$K(x) = \text{Knives} \quad x = \text{day} \quad K'(x) = \text{Knives/Day}$$

a. $K'(x) = -2x + 15$

b. $K'(4) = -2(4) + 15$
 $= -8 + 15$
 $= 7 \text{ Knives/Day}$

On day 4 of OJ endorsing Ginzu Knives, the daily knife sales are increasing by 7 knives per day.

c. $K'(10) = -2(10) + 15$
 $= -20 + 15$
 $= -5 \text{ Knives/Day}$

On day 10 of OJ endorsing Ginzu Knives, the daily knife sales are decreasing by 5 knives per day.