EXPONENTIAL GROWTH & DECAY SECTION 1.7



ASSUMING THE POPULATION IS GROWING EXPONENTIALLY, FIND A FORMULA FOR THE POPULATION P IN YEARS Ł

SINCE 1984. $P = P_0 pulation (IN millions) \rightarrow P = P_0 e^{kt}$ $t = Y_{R9} since 1984 \qquad P = 19.5 e^{kt} \rightarrow Now we just need to$ Find k.

WE KNOW: WHEN
$$f=25$$
, (ie. IN YR 2009) $P=39.0$, so.. LET'S PLUG THIS INFO IN.
 $39 = [9.5e^{25k}$ Solve FOR k, ISOLATE EXPONENTIAL
 $\frac{39}{19.5} = e^{35k}$ then LOCARITHMEATE.

Pgi

$$\ln\left(\frac{39}{19.5}\right) = \ln\left(e^{a5k}\right)$$
$$= 25 k \cdot \ln\left(e^{a5k}\right)$$
$$AND \quad K = \frac{\ln\left(\frac{39}{19.5}\right)}{a6} = \frac{1028}{1028}$$

DUR FORMULA FOR THE POP. GROWTH IS $\rightarrow N_{otc}$: k=0.028 = 2.8%MEANS POPULATION OF CONTRY GREN AT A CONTINUOUS PATE OF 2.8% FOR YEAR.

THE FOLLOWING FORMULAS GIVE THE POPULADONS OF Y DIFFERENT TOWNS, WITH t IN YEARS FROM NOW. BRILLIANT, OHIO $P = 600e^{0.08t}$ LITTLE (ANADA, MINNESOTA $P = 1000e^{-0.02t}$ SPUDS, FLORIDA $P = 1200e^{0.02t}$ OKAY, OKLAHOMA $P = 900e^{0.12t}$

• WHICH TOWN IS GROWING FASTEST? DLAY, DK IS GROWING FASTEST. GROWTH RATE 16 1250!

• ARE ANY TOWNS DECREASING IN SIZE?

YES, LITTE CANADA IS DECREASING AT A RATE OF 28 / YR.

· LIGT THE TOWNS FROM FASTEST GROWING TO SMALLEST GROWING.

DEAY DECAHOMA - FASTEST, GROWTH RATE IS 12% BRIWIANT, ON CO - GROWTH RATE IS 8% SPUDS, FCOLEDA - GROWTH RATE IS 3%

LITTE CANADA ------- SLOWEST ... GROWTH PATE 15 -29%

• WHICH TOWN HAS THE LARGEST POPULATION RIGHT NOW? (WHEN 2=0)

 $P = |200 e^{0.080} = |200|$