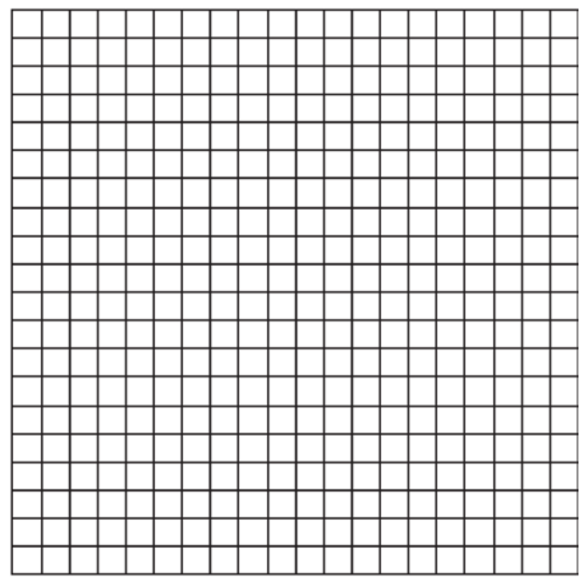
Name: ________________________

A.CED.A.1: Exponential Decay

1 The amount A, in milligrams, of a 10-milligram dose of a drug remaining in the body after t hours is given by the formula $A = 10(0.8)^t$. Find, to the *nearest tenth of an hour*, how long it takes for half of the drug dose to be left in the body.

2 Depreciation (the decline in cash value) on a car can be determined by the formula $V = C(1-r)^t$, where V is the value of the car after t years, C is the original cost, and r is the rate of depreciation. If a car's cost, when new, is $15,000, the rate of depreciation is 30%, and the value of the car now is $3,000, how old is the car to the *nearest tenth of a year*?

3 The current population of Little Pond, New York, is 20,000. The population is *decreasing*, as represented by the formula $P = A(1.3)^{-0.234t}$, where P = final population, t = time, in years, and A = initial population. What will the population be 3 years from now? Round your answer to the *nearest hundred people*. To the *nearest tenth of a year*, how many years will it take for the population to reach half the present population? [The use of the grid is optional.]

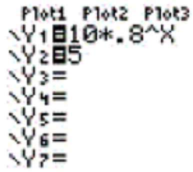


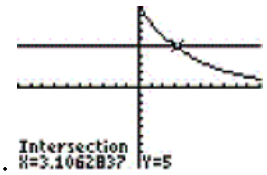
A.CED.A.1: Exponential Decay
Answer Section

1 ANS:

3.1. Half the dose is left, $A=5$:

$$5=10(0.8)^t$$
$$\frac{5}{10}=0.8^t$$
$$\log\frac{5}{10}=\log 0.8^t$$
$$\log 0.5=t\log 0.8$$
$$t=\frac{\log 0.5}{\log 0.8}\approx 3.1$$



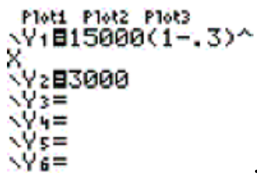


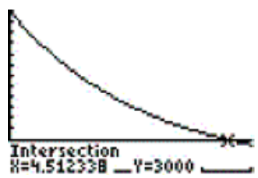
REF: 080132b

2 ANS:

4.5.

$$V=C(1-r)^t$$
$$3000=15000(1-.3)^t$$
$$.2=.7^t$$
$$\log .2=\log .7^t$$
$$t=\frac{\log 0.2}{\log 0.7}\approx 4.5$$



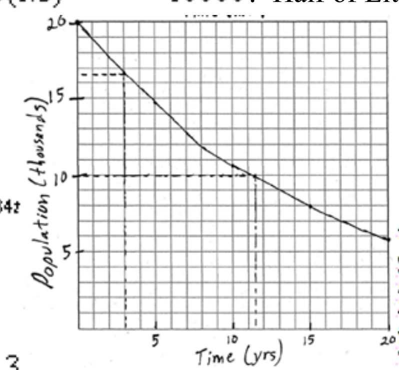


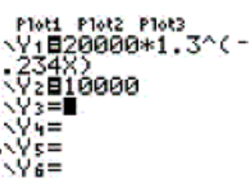
REF: 010230b

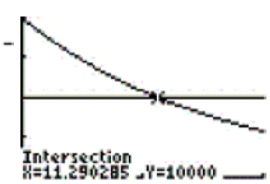
3 ANS:

16,600, 11.3. $P=20000(1.3)^{-0.234\cdot 3}\approx 16600$. Half of Little Pond's present population is 10,000.

$$10000=20000(1.3)^{-0.234t}$$
$$.5=(1.3)^{-0.234t}$$
$$\log .5=\log 1.3^{-0.234t}$$
$$\log .5=-0.234t\cdot\log 1.3$$
$$\frac{\log .5}{\log 1.3}=-0.234t$$
$$t\approx 11.3$$







REF: 010632b