Determine if the following functions are exponential functions. Explain your answer.

1) $y = 2^x$ Yes

2) $y = x^2$ No

3) $y = 3 \cdot \left(\dfrac{1}{2}\right)^x$ Yes

4) $y = (1.05)^x$ Yes

5) $y = 3 \cdot 9^{-x}$ Yes

6) $y = 0.95^x$ Yes

7) $y = 0.5 \cdot x^{1/2}$ No

8) $y = 3x^5 + 3x$ No

9) $y = \pi^{x+1}$ Yes

Tell whether the exponential function shows growth or decay. Explain your answer.

10) $y = 4^x$ Growth

11) $y = \left(\dfrac{1}{4}\right)^x$ Decay

12) $y = (0.5)^x$ Decay

13) $y = (1.2)^x$ Growth

14) $y = 2 \cdot \left(\dfrac{3}{4}\right)^x$ Decay

15) $y = 3 \cdot \left(\dfrac{5}{2}\right)^x$ Growth

16) $y = 4^{-x}$ Decay

17) $y = \left(\dfrac{1}{3}\right)^{-x}$ Growth

18) $y = 3 \cdot 2^{x-2} + 2$ Growth

Use a table of values to graph the exponential functions.

19)

$f(x) = 2^x$	
x	$f(x)$
-3	1/8
-2	1/4
-1	1/2
0	1
1	2
2	4
3	8
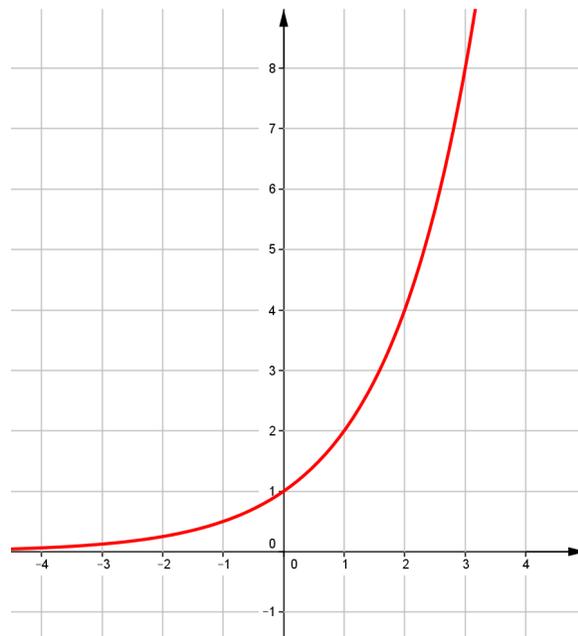
20)

$f(x)=\left(\dfrac{1}{3}\right)^{x}$	
x	$f(x)$
-2	9
-1	3
0	1
1	1/3
2	1/9
3	1/27
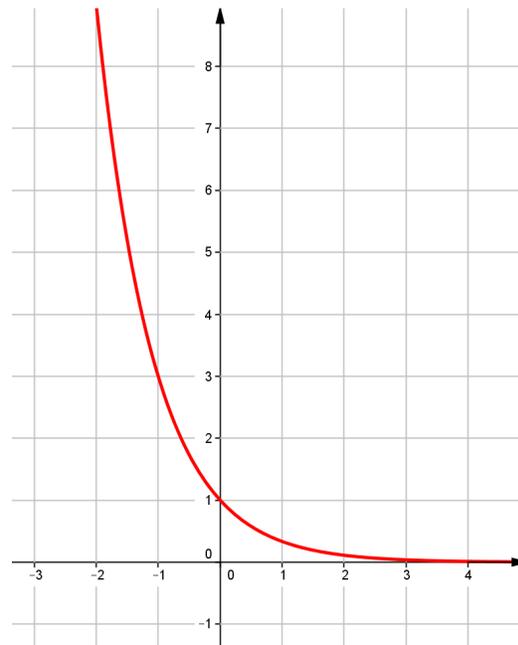
21)

$f(x)=-2\cdot(2)^{-x}$	
x	$f(x)$
-2	-8
-1	-4
0	-2
1	-1
2	$-1/2$
3	$-1/4$
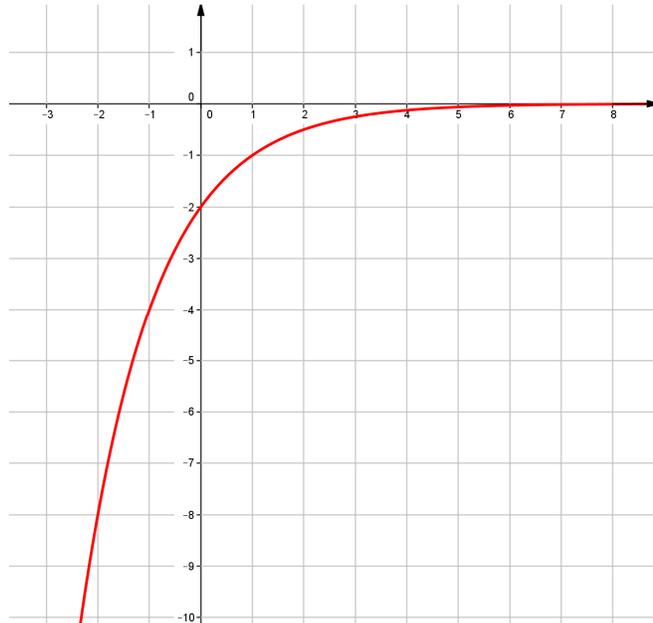
Model the following problems as an exponential function of the form: $A(t) = a\left(1 \pm r\right)^{t}$

22) A certain car depreciates about 15% each year.

   a) Write a function to model the depreciation value for a car that was originally worth $20,000.

$$A(t) = 20,000\left(0.85\right)^{t}$$

   b) Suppose the car was originally worth $20,000 in 2005. What is the first year in which the value of the car will be worth less than half of the original value?

$$\boxed{2010}$$

23) Rose invests $5000 in an account that pays 6.25% interest per year.

   a) Write a function that models the growth in value of her investment.

$$A(t) = 5,000\left(1.625\right)^{t}$$

   b) After how many years will her investment be worth $10,000?

$$\approx 11.4 \text{ Years}$$

24) A city population, which was initially 15,000 has been dropping by 3% a year.

   a) Write an exponential function that models the drop in population.

$$A(t) = 15,000\left(0.97\right)^{t}$$

   b) When will the population drop below 8000?

$$\approx 20.6 \text{ Years}$$

25) Radon-222 is a gas that escapes from rocks and soil. It can accumulate in buildings and can be dangerous for people who breathe it. Radon-222 decays to polonium and eventually to lead.

Radon-222 Decay
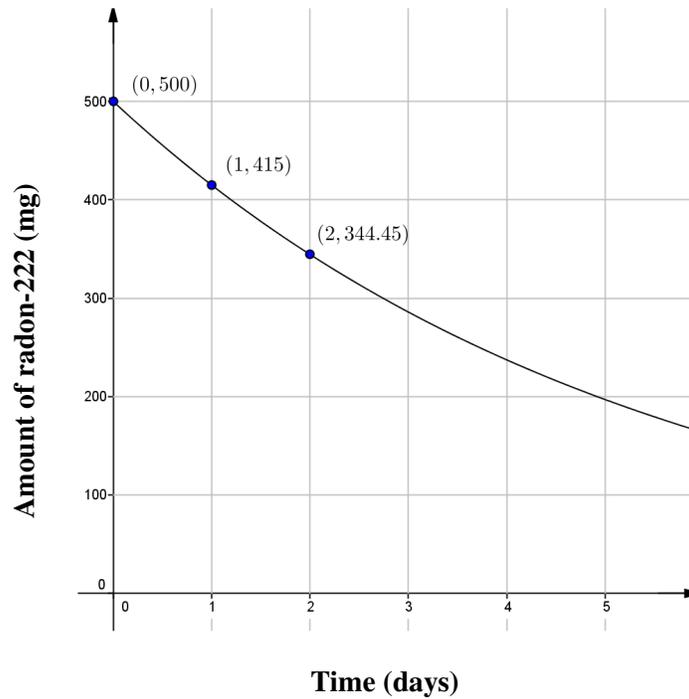
a) Using the graph above, find the percent decrease in the amount of radon-222 each day.

$$\boxed{17\%}$$

b) Write an exponential decay function for the amount of 500 mg sample of radon-222 remaining after t days.

$$\boxed{A(t) = 500(0.83)^t}$$

c) How much of the radon-222 sample would remain after 14 days?

$$\boxed{36.8 \text{ mg}}$$