

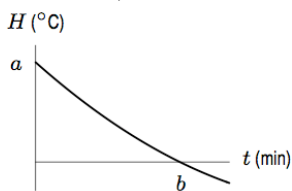
1.  $f(x)$  is the age of Antarctic ice (in hundreds of years) at a depth of  $x$  meters below the surface.
- (a) In words, what is the practical meaning of  $f(10)$ ?
- (b) Is  $f$  increasing or decreasing, and why?

2. From the following table

**Table 1.1.1**

$x$	1	2	3	4	5	6
$f(x)$	2	3	7	6	4	2

- (a) Find  $f(3)$ .
- (b) Find the value(s) of  $x$  that give  $f(x) = 2$ .
3. An object is put outside on a cold day and its temperature,  $H$ , in degrees Celsius, is a function of the time,  $t$ , in minutes since it was put outside.
- (a) What does the statement  $H(30) = 10$  mean? Use words and remember to include units in your answer.
- (b) The graph of  $H$  versus  $t$  is shown below. Explain in terms of temperature of the object and the time outside, what each of the following mean.



**Figure 1.1.3**

- i. vertical intercept  $a$
- ii. horizontal intercept  $b$
4. Suppose  $g(x)$  is an exponential function. Complete the table of values for the function  $g$  below.

$x$	0	5	10	15	20
$g(x)$	10	20	?	?	?

Now find a formula for  $g(x)$ .

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5. Values for  $g(x)$  are given in the table below. Is  $g(x)$  concave up, concave down, or neither?

**Table 1.3.9**

$x$	1	2	3	4	5	6
$g(x)$	100	90	81	73	66	60

6. Sketch a graph of a function that is ~~decreasing~~ at an increasing rate.  
Increasing at an increasing rate

7. A population is growing according to the function  $P = 250(1.065)^t$ , where  $P$  is the population at time  $t$ .

(a) What is the initial population?

(b) What is the annual growth rate?

(c) What is the population in year 10?

(d) How many years will it take for the population to reach 1000?

8. An exponentially decaying substance was weighed every hour and the results are given below. If the

formula  $Q = Q_0 e^{-kt}$  gives the weight of the substance,  $Q$ , at time  $t$  in hours since 9 am, then

$Q_0 =$  \_\_\_\_\_ and  $k =$  \_\_\_\_\_. Round  $k$  to 2 decimal points.

Time	Weight (in grams)
9 am	14
10 am	12.542
11 am	11.235
12 noon	10.065
1 pm	9.017

9. A bakery has 200 lbs of flour. If they use 5% of the available flour each day, how much do they have after 10 days? How much do they have left after  $n$  days?

10. If  $8 \cdot (2.5^x) = a \cdot e^{kx}$  find  $a$  and  $k$ .

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11. If the size of a bacteria colony doubles in 8 hours, how long will it take for the number of bacteria to be 5 times the original amount?
12. A cigarette contains about 0.4 mg of nicotine. The half-life of nicotine in the body is about 2 hours. How long does it take after smoking a cigarette, for the level of nicotine in a smoker's body to be reduced to 0.08 mg?

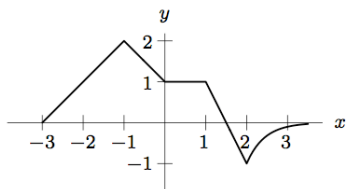
13. Use the table below.

**Table 1.8.19**

$x$	0	1	2	3	4
$f(x)$	2	4	6	3	5
$g(x)$	5	3	2	1	0

Find  $f(g(1))$ ,  $g(f(1))$ ,  $f(g(3))$ ,  $g(f(3))$

14. The graph of  $y = f(x)$  is shown below.



**Figure 1.8.23**

Sketch the graph of  $y = 2 - 2f(x)$ .

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15. The number of species  $S$  on an island is proportional to the square root of the area  $A$  of the island. An island with an area of 4 square miles contains 20 species.

(a) Find a formula for  $S$  as a function of  $A$ .

(b) If an island is 9 square miles in area, determine the number of species expected on the island.

16. Consider the function given in the table below.

**Table 1.10.22**

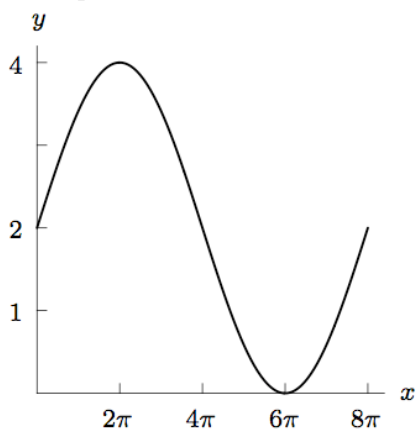
$x$	1	2	3	4	5	6	7	8	9
$f(x)$	-2	0	-2	-4	-2	0	-2	-4	-2

(a) Explain why the function represented in the following table appears to be periodic.

(b) Approximate the period and the amplitude of the function.

(c) Assuming the function is periodic, estimate  $f(10)$  and  $f(15)$ .

17. Find an equation which defines the function shown below.



**Figure 1.10.31**