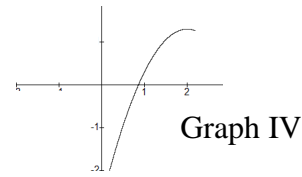
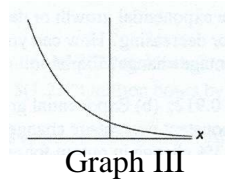
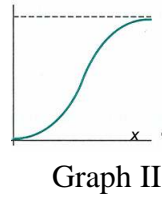
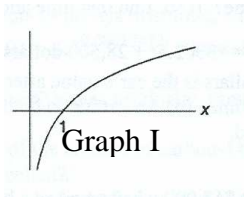


**MULTIPLE CHOICE**

Mark your responses on the scantron form.

(3 pts each)

1. Identify each of the three graphs from the six basic types studied thus far: *linear, exponential, logarithmic, logistic, quadratic, and cubic*.  
Select the statement that correctly identifies each of the four graphs.



- a. Graph I is logarithmic, Graph II is logistic, Graph III is quadratic, and Graph IV is exponential.
- b. Graph I is quadratic, Graph II is logistic, Graph III is exponential, and Graph IV is cubic.
- c. Graph I is logarithmic, Graph II is logistic, Graph III is exponential, and Graph IV is quadratic.
- d. Graph I is linear, Graph II is cubic, and Graph III is logarithmic, and Graph IV is quadratic.

2.  $H(t)$  hats are sold at the circus where  $t \frac{\text{dollars}}{\text{hat}}$  is the price of a hat.  
 $R(t) = t \cdot H(t)$  represents a new function that can be constructed.

Which statement most accurately describes the new function?

- a.  $R(t) = t \cdot H(t)$  dollars gives the revenue where  $t \frac{\text{dollars}}{\text{hat}}$  is the price of a hat.
- b.  $R(t) = t \cdot H(t)$  dollars gives the revenue where  $t$  is the number of hats purchased.
- c.  $R(t) = t \cdot H(t)$  dollars gives the demand where  $t$  is the number of hats purchased.
- d.  $R(t) = t \cdot H(t)$  dollars gives the profit where  $t \frac{\text{dollars}}{\text{hat}}$  is the price of a hat.

3. The cost of living between 1957 and 2007 for a family of four can be modeled by  
 $C(x) = 2(2.358^x)$  thousand dollars where  $x$  is the number of years after 1957.

Which of the following choices most accurately gives the constant percentage change for  $C(x)$ ? (with units)

- a. 2.358%
- b. 135.8%
- c. 1.358%
- d. 358%

4. Give the equations for the horizontal asymptotes of  $f(x) = \frac{22.4}{1 + 7.6e^{-9.36x}}$ .

a.  $y = 22.4$  and  $y = 7.6$

b.  $y = 40$  and  $y = 0$

c.  $y = 22.4$  and  $y = 0$

d.  $y = 22.4$  and  $y = 8.6$

5. Which ONE of the following statements about a logarithmic function  $f(x)$  is FALSE?

a. The general form of  $f(x)$  is  $f(x) = a + b \ln x$ b. The graph of  $f(x)$  is either always concave up or always concave down. c. The graph of  $f(x)$  has a horizontal asymptote.d. The graph of  $f(x)$  has a vertical asymptote.

6. Using data beginning with 2003 and ending with 2009, Clemson's student body population can be modeled by  $P(t)$  thousand people where  $t$  is the number of years after 2000.

Which one of the following statements is true?

a.  $P(2)$  is interpolation and  $P(8)$  is interpolation.b.  $P(2)$  is interpolation and  $P(8)$  is extrapolation. c.  $P(2)$  is extrapolation and  $P(8)$  is interpolation.d.  $P(2)$  is extrapolation and  $P(8)$  is extrapolation.

7. The MSRP of a 2005 Chrysler Sebring is \$31,265 in 2005. Between 2005 and 2008, the car's value decreased by 15% each year.

Complete the model

\_\_\_\_\_ dollars gives the value of the Chrysler Sebring, where  $x$  is the number of years after 2005,  $0 \leq x \leq 3$

a.  $V(x) = 31,265 - 0.15x$

b.  $V(x) = 31,265(0.85^x)$

c.  $V(x) = 31,265(1.15^x)$

d.  $V(x) = 31,265 - 4689.75x$

8. A small music store in Clemson sold 567 CDs in the month of January 2005. Over the next year the number of CDs sold has decreased at a constant rate of 22 CDs per month.

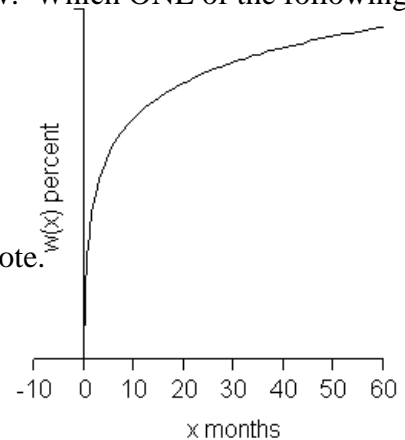
Complete the model.

\_\_\_\_\_ gives the number of CDs sold,  $x$  months after January 2005,  
 $0 \leq x \leq 12$

- a.  $S(x) = 567(-0.22^x)$                       b.  $S(x) = 567x - 22$   
 c.  $S(x) = 567(-0.78^x)$                       **d.  $S(x) = 567 - 22x$**

9. Consider the graph of  $w(x) = 24.95 + 10.17\ln(x)$  shown below. Which ONE of the following statements about the graph of  $w(x)$  is true?

- a.**  $w(x)$  is concave down and has a vertical asymptote.  
 b.  $w(x)$  is concave up and has a vertical asymptote.  
 c.  $w(x)$  is concave up and has a vertical and a horizontal asymptote.  
 d.  $w(x)$  is concave down and has a horizontal asymptote.



10.  $C(x) = 3.5x + 1000$  dollars gives the cost to print  $x$  books

$R(x) = 4.75x$  dollars gives the revenue from the sale of  $x$  books

How many books must be sold in order to break even?

- a. 1000                                      b. 121  
**c. 800**                                      d. 122

**Use the following information to answer questions #11 and #12.**

$S(t)$  dollars is the commission you receive based on the number,  $t$ , of Clemson folding tents that you sell

$T(h)$  is the number of Clemson folding tents you sell after working  $h$  hours

11. Which one of the following results in the construction of a meaningful new function using  $S(t)$  and  $T(h)$ ?

- a. addition                                      **b. composition**  
 c. multiplication                              d. subtraction

12. The input and output units for the new function are:

- a. input = chairs, output = dollars
- b. input = hours, output = chairs
- c. input = hours, output = dollars
- d. input = chairs, output = hours

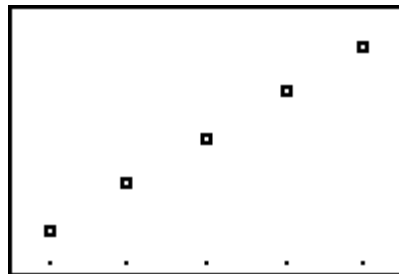
13. The cost for a benefit concert is given by  $C(x)$  dollars where  $x$  is the number of tickets sold. The profit for the benefit concert is modeled by  $P(x)$  dollars where  $x$  is the number of tickets sold.

These two functions can be combined to determine the revenue function  $R(x)$ . Give the notation for the revenue function.

- a.  $R(x) = P(x) \cdot C(x)$
- b.  $R(x) = P(x) + C(x)$
- c.  $R(x) = \frac{P(x)}{C(x)}$
- d.  $R(x) = \frac{C(x)}{P(x)}$

14. A scatter plot and the results of the DIFF program are shown below. Which of the following functions is the most appropriate choice for modeling the data?

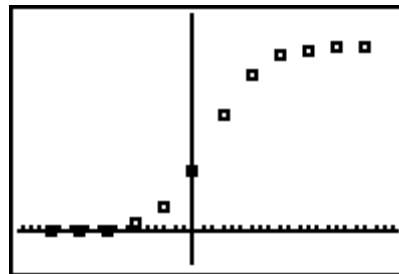
- a. Linear
- b. Quadratic
- c. Exponential
- d. Logarithmic



L3	L4	L5	4
3.88	-.08	6.4613	
3.8	.09	5.944	
3.89	-.03	5.7434	
3.86	-----	5.3896	
-----		-----	
L4 = ■			

15. A scatter plot and the results of the DIFF program are shown below. Which of the following functions is the most appropriate choice for modeling the data?

- a. Quadratic
- b. Logarithmic
- c. Cubic
- d. Logistic



L3	L4	L5	4
.0286	.0652	231.06	
.0938	.20533	228.88	
.29913	.57582	221.94	
.87495	1.1495	201.64	
2.0245	.88288	154.67	
2.9074	-.6838	87.221	
2.2236	-1.206	35.631	
L4 = (.0651955082...			

16. The population of Six Mile between 1990 and 2008 can be modeled by:  
 $P(x) = 12x + 394$  people,  $x$  years after 1990.

What is the practical interpretation for the slope of  $P(x)$  ?

- a. The town's population is increasing by 394 people/year.
- b. The town's population is decreasing by 12 people/year.
- c. The town's population is increasing by 120 people/year.
- d. The town's population is increasing by 12 people/year.

17. Let  $P(t) = \frac{-7.8}{1 + \ln(t + 5)}$ ; Evaluate  $P(3.2)$ . (Give your answer correctly rounded to 3 decimal places.)

- a. -5.696
- b. -1.637
- c. -2.513
- d. 2.513

18. The Department of Energy, has modeled the average price for a barrel of oil as  $B(x)$  hundred dollars, where  $x$  is the number of days since the beginning of 2008,  $0 \leq x \leq 180$ .

Write the mathematical notation for the following sentence:

“On January 18, the average price for a barrel of oil was \$114.”

- a.  $B(18) = 114$
- b.  $B(180) = 11.4$
- c.  $B(2008) = 114$
- d.  $B(18) = 1.14$

19. The population of South Asia for selected

Year	1950	1960	1970	1980	1990
Population of South Asia (in thousands)	497	606	759	952	1178

years is shown in the table below.

Source: Environmental Protection Agency

Align the input data to the number of years since 1950. Complete the model:

“\_\_\_\_\_” thousand people gives the population in South Asia, where  $x$  is the number of years since 1950,  $0 \leq x \leq 40$ .

- a.  $f(x) = 17.08x + 456.8$
- b.  $f(x) = 492.745(1.022^x)$
- c.  $f(x) = 1.781(1.022^x)$
- d.  $f(x) = 0.196x^2 + 9.251x + 495.943$

20. A camping supplier charges a \$6.95 standard shipping fee and \$19.97 per pair of pants for orders between 1 and 20 pairs of pants. Which of the following models best describes the above situation?

- a.  $C(x) = 19.97x + 6.95$  dollars is the cost to order  $x$  pairs of pants for  $1 \leq x \leq 20$
- b.  $C(x) = (19.97 + 6.95)x$  dollars is the cost to order  $x$  pairs of pants for  $1 \leq x \leq 20$
- c.  $C(x) = 19.97(6.95^x)$  dollars is the cost to order  $x$  pairs of pants for  $1 \leq x \leq 20$
- d.  $C(x) = 6.95(19.97^x)$  dollars is the cost to order  $x$  pairs of pants for  $1 \leq x \leq 20$

**END of the MULTIPLE CHOICE: You should have answered 20 questions on the SCANTRON FORM.**

### FREE RESPONSE

*Show work where appropriate. Clearly identify your answer. Be certain that you answer the question that is asked.*

1. The number of fines paid for parking tickets is given in the table:

Days after semester starts	20	30	60	90	100
Number of fines	108	83	61	47	25

a. Look at a scatter-plot. Give the name of the equation type (*linear, exponential, logarithmic, logistic, quadratic, or cubic*) that is most appropriate to model this data set. (4 pts)

cubic (A/N)

- b. Support your choice of equation type with two distinct characteristics of the data set. (4 pts)

2 concavities or 1 inflection point  
no limiting values

( 2 pts for each correct reason)

- c. Fit the appropriate equation to the data. Completely define your model. Report values rounded correctly to 3 decimal places. (7 pts)

$f(x) = -6.25E-4x^3 + .116x^2 - 7.188x + 210.717$  gives the number of fines for parking tickets paid  $x$  days after the start of the semester.

( ½ pt if no “f(x)”, ½ pt off for no E-4; 2 pts for output description and units, 1 point for input description, 1 point for input domain, ½ pt for incorrect rounding)

2. At 8 am, a Petri dish contains 1100 bacterial cells and the number of bacterial cells is increasing by 6.50% every hour.

Complete the model:

(4 pts)

$P(t) = 1100(1.065^t)$  gives the number of bacterial cells in the Petri dish,  $t$  hours after 8am.  
(1 point for incorrect starting value, 2 points for incorrect constant multiplier)

3. At a restaurant, when “ $a$ ” appetizers are ordered between 5 pm and 7 pm,  $Q(a)$  gives the expected number of chicken quesadilla appetizers ordered,  $0 \leq a \leq 100$ .

Write a sentence of practical interpretation for the following notation  $Q(50) = 13$ . (4 pts)

When 50 appetizers are ordered between 5 pm and 7 pm, 13 of those appetizers will be chicken quesadillas.

(1 point each for incorrect input value and description, 1 point each for incorrect output value and description)

4. The number of students in Oconee County attending public schools can be modeled by  $S(x)$  thousand, for the  $x^{\text{th}}$  month of the 2007-2008 school year.

Give the function notation for the following statement.

“During the sixth month of the 2007-2008 school year, 17,246 students attended public school in Oconee County.” (4 pts)

$S(6) = 17.246$

(1.5 points for incorrect  $S(6)$ , 2.5 points for incorrect decimal placement (A/N))

5. Given  $f(x) = -0.008x^3 + 0.12x^2 + 0.32x + 1.5$ . [Checkpoint:  $f(2) = 2.556$ ]  
Find **all** values of  $x$  such that  $f(x) = 8$ . Give your answers rounded correctly to 3 decimal places. (5 pts)

$$x = -7.046, 8.537, \text{ and } 13.509$$

(-1/2 point for incorrect rounding, - 2 points for first 2 values, for tracing, only 2 points total possible)

6. Given  $S(t) = \frac{120}{1 + 3.5e^{-2t}}$ . Find  $S(t)$  when  $t = 4$ . (3 pts)

$$S(2) = 119.859$$

(A/N)

7. The models provided along with the graphs below give the revenue, cost, and profit for a Mexican restaurant.

- $R(x) = -0.07x^2 + 15.03x + 15$  dollars gives the revenue when  $x$  is the number of buffet dinners purchased,  $1 \leq x \leq 70$  [Check:  $R(2) = 44.78$ ]
- $C(x) = 5x + 200$  dollars gives the cost when  $x$  is the number of buffet dinners purchased,  $1 \leq x \leq 70$  [Check:  $C(2) = 210$ ]
- $P(x) = -0.07x^2 + 10.03x - 185$  dollars gives the profit when  $x$  is the number of buffet dinners purchased,  $1 \leq x \leq 70$  [Check:  $P(2) = -165.22$ ]

Use the information given to find the  $x$  input value at the break-even point rounded correctly to three decimal places. (Do not try to estimate by graphing.) SHOW SOME WORK.

(5 pts)

Must show either  $P(x) = -0.07x^2 + 10.03x - 185 = 0$  and solving for  $x$

OR

$$R(x) - C(x) = 0$$

$$P(x) = 0, x = 21.745$$

(-3 points if no work shown, - 2 points if incorrect  $x$  value)

**END OF THE TEST**