

Name _____

1. (7 points) There were 4000 people living in a small town in the year 1960. Suppose that this town's population then decreased at an annual rate of 6% per year. What formula gives the town's population t years after 1960?

(a) $P(t) = 4000(0.94)^t$

(b) $P(t) = 4000(1.06)^t$

(c) $P(t) = 4000(0.06)^t$

(d) $P(t) = 4000e^{0.06t}$

(e) $P(t) = 4000e^{1.06t}$

2. (7 points) Suppose that \$1000 is invested in an account which earns interest at 5% compounded continuously. How many years does it take for the balance in this account to reach 2500 ?

(a) 18.3

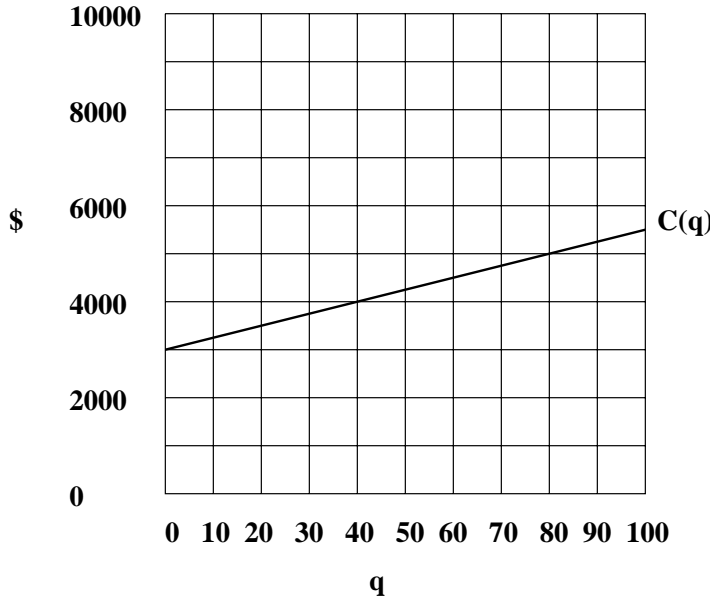
(b) 18.5

(c) 18.7

(d) 18.9

(e) 19.1

[Questions 3–5] The cost in dollars for a company to produce q chemistry sets is given by the linear function $C(q)$ whose graph is shown below. When the company sells these chemistry sets, they charge \$75 for each set.



3. (5 points) What are the fixed costs to this company?

(a) \$25 (b) \$75 (c) \$2500 (d) \$3000 (e) \$5500

4. (5 points) What is the formula for the cost function $C(q)$?

(a) $C(q) = 3000q + 25$

(b) $C(q) = 25q$

(c) $C(q) = 25q + 3000$

(d) $C(q) = 55q + 3000$

(e) $C(q) = 75q + 3000$

5. (5 points) How many chemistry sets must this company produce and sell in order to break even (i.e., to have a profit of \$0) ?

(a) 50 (b) 55 (c) 60 (d) 65 (e) 70

6. (7 points) Given that $3^t = 2$, what is the exact value of t ?

(a) $\frac{2}{3}$

(b) $\ln\left(\frac{2}{3}\right)$

(c) $\ln\left(\frac{3}{2}\right)$

(d) $\frac{\ln 2}{\ln 3}$

(e) $\frac{\ln 3}{\ln 2}$

7. (7 points) If $f(x) = \sqrt{2^x + 1}$, then which number best approximates the value of $f'(7)$?

(a) 3.5

(b) 3.7

(c) 3.9

(d) 4.1

(e) 4.3

8. (7 points) A biologist studied the growth of a rabbit population in a field. She let $f(t)$ represent the number of rabbits t weeks from the start of her research. Suppose that $f'(9) = 8$. Which of the following sentences must be true?

- (a) Eight weeks after the start of her research, there were nine rabbits in the field.
- (b) During the first nine weeks of her research, the rabbit population increased an average of eight rabbits per week.
- (c) During the first eight weeks of her research, the rabbit population increased an average of nine rabbits per week.
- (d) Eight weeks after the start of her research, the rabbit population was increasing by nine rabbits per week.
- (e) Nine weeks after the start of her research, the rabbit population was increasing by eight rabbits per week.

9. (7 points) H. Graver Packing Co. was formed in Chicago in the early 1900's. The table below shows the number of workers employed by the company in the given year.

year	1920	1930	1940	1950	1960	1970
number of employees	25	45	70	95	115	150

On average, how quickly was the number of employees increasing between 1920 and 1970?

- (a) 0.4 people per year
- (b) 2.5 people per year
- (c) 3.0 people per year
- (d) 3.5 people per year
- (e) 125 people per year

[Questions 10–12] A table of values is given for a function. Circle **linear** if the function could be linear, circle **exponential** if the function could be exponential, and circle **neither** if it is impossible for the function to be either linear or exponential. You do not need to find formulas for any of the functions.

10. (5 points)

x	$f(x)$
0	125
2	50
4	20
6	8

linear, **exponential**, **neither**

11. (5 points)

x	$g(x)$
0	0.03
2	0.15
4	0.75
6	3.75

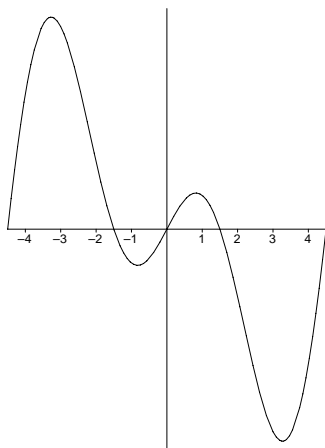
linear, **exponential**, **neither**

12. (5 points)

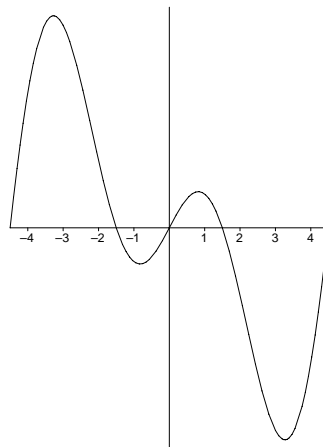
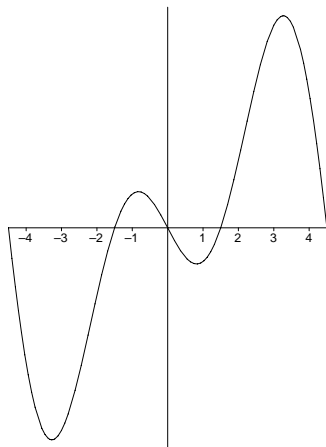
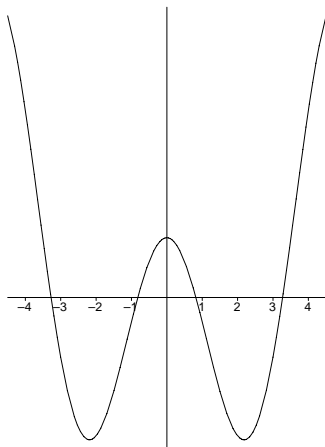
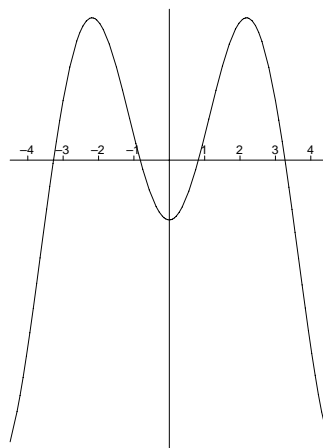
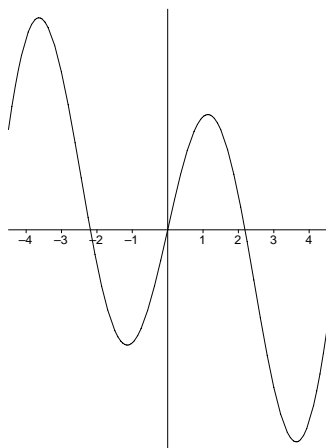
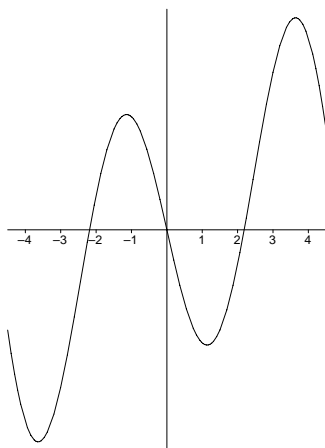
x	$h(x)$
0	6
2	2
4	-2
6	-6

linear, **exponential**, **neither**

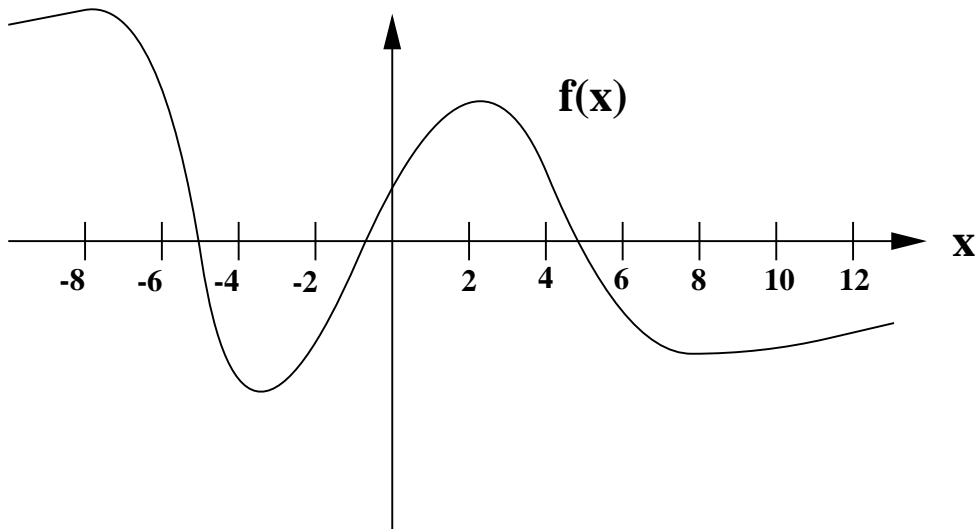
13. (7 points) The graph of $f(x)$ is shown below.



Circle the graph of $f'(x)$, given that it is one of the 6 choices below.



[Questions 14–16] Use the graph of $f(x)$ given below to answer the following questions.



14. (5 points) Of the following four quantities, circle the one that has the largest positive value.

$f'(0),$

$f'(2),$

$f'(4),$

$f'(6)$

15. (5 points) Of the following four quantities, circle the one that has the largest positive value.

$f(0),$

$f(2),$

$f(4),$

$f(6)$

16. (5 points) Of the following three quantities, circle the one that has the largest positive value.

$$\frac{f(10) - f(2)}{10 - 2},$$

$$\frac{f(4) - f(0)}{4 - 0},$$

$$\frac{f(2) - f(-4)}{2 - (-4)}$$

17. (6 points) Iodine-131 has a half-life of 8 days and is used in the treatment of hyperthyroid. Due to a strike at UPS, it took 20 days for a shipment of Iodine-131 to be sent from the producer to a hospital. What percentage of the original amount shipped actually arrived at the hospital?

(a) 12.4%

(b) 17.7%

(c) 19.8%

(d) 25.2%

(e) 27.5%