Answers to Test 1

1. Last month Mary rented a car twice from the Cars-R-Us Car Rental Company, which charges a certain amount just for renting the car, plus a certain amount per mile. The first time, she drove the car 200 miles and was charged $120. The second time, she drove the car 50 miles and was charged $45. How much does Cars-R-Us charge per mile?

   (a) $0.20   (b) $0.25   (c) $0.50   (d) $0.10   (e) $0.40

2. Find the y-intercept of the line $x + 2y = 3$.

   (a) $\dfrac{3}{2}$ (b) $\dfrac{1}{2}$ (c) 3   (d) -3 (e) $-\dfrac{3}{2}$

3. If $f(x) = \dfrac{(x-1)^2}{(x+1)^2}$, find $f(a+1)$.

   (a) $\dfrac{(a-1)^2}{(a+1)^2}$ (b) $\dfrac{(a+1)^2}{(a+2)^2}$ (c) $\dfrac{(a-1)^2}{(a+1)^2} + 1$ (d) $\dfrac{a}{a+2}$ (e) $\dfrac{a^2}{(a+2)^2}$

4. A rock is thrown from the top of a 48-foot tower straight up into the air at time $t = 0$ with an initial velocity of 32 feet per second. Its height h at time t is given by the formula

$$h = -16t^2 + 32t + 48.$$

At what time does the rock hit the ground?

(a) $t = 2$ (b) $t = 3$ (c) $t = 4$ (d) $t = 1$ (e) $t = 5$

5. It is determined that a certain company earns a profit of $200x - 2x^2$ (in dollars) per day for producing x units of their product. What is the maximum possible profit that they can earn in one day?

(a) $10,000   (b) $100   (c) $5,000   (d) $200

(e) No profit – no matter what x is, they lose money.

6. What is the natural domain of the function
$$f(x) = \frac{5x}{(x^2 + 1)(\sqrt{x - 2})}?$$

(a) $x \geq 2,\ x \neq -1$ (b) $x > 2$ (c) all real x (d) $x \neq 0$ (e) $x \neq 2$

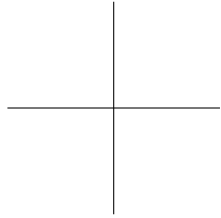7. Suppose the function f is given by the multi-line definition

$$f(x) = \begin{cases} x^2, & x \leq 1; \\ x - 1, & 1 < x < 3; \\ -\frac{1}{3}x + 3, & x \geq 3. \end{cases}$$

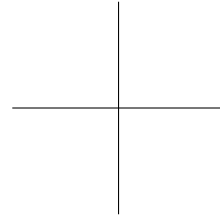Where does f have discontinuities?

(a) At $x = 1$ and $x = 3$.   (b) At $x = 3$ only.   (c) At $x = 0$.

(d) At $x = 1$ only.   (e) Nowhere; f is continuous.

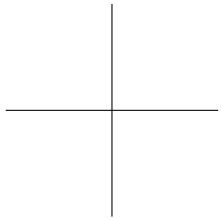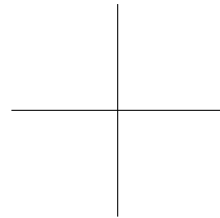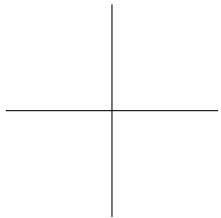8. Which of the following could be the graph of $y = b^x$ for some $b > 1$?

(a)

(b)

(c)

(d)

(e)

9. Jack invests $5000 in an account that earns an annual rate of 7%, compounded monthly. If he makes no further deposits or withdrawals, what will be the value of the account after one year (in dollars)?

(a) 5000

(b) $5000 \left(1 + .07\right)^1$

(c) $5000 \left(1 + \frac{.07}{12}\right)^1$

(d) $5000 \left(1 + .07\right)^{12}$

(e) $5000 \left(1 + \frac{.07}{12}\right)^{12}$

Part II. Partial Credit

Show all work, and put your final answer in the space provided. You will receive no credit if your answer is not in the space provided, and no partial credit for a wrong answer if you do not show your work.

10. A widget company finds that in order to make x widgets in a given month, their cost function (in dollars) is $C(x) = 1000 + 3x$. Suppose they charge $5.00 per widget.

(a) (3 points) Express their monthly profit function as a function of x.

Answer:_____

(continued on next page)

(b) (2 points) How many widgets should they produce in order to break even?

Answer:_____

11. (a) (2 points) What is the slope of the line $2x + 3y = 4$?

Answer:_____

(b) (3 points) Find the equation of the line through the point $(-1, -2)$ and parallel to the line $2x + 3y = 4$.

Answer:_____

12. (5 points) The following is a table of values for some function.

x	0	2	4	6	8	10
y	18	15	12	9	6	3

If the function is linear, write it explicitly in the form $y = mx + b$. If it is not linear, explain clearly why it is not.

Answer:_____

13. (a) (4 points) Complete the square of the quadratic equation $y = 2x^2 + 4x + 6$.

Answer:_____

(b) (1 point) Does the graph of the equation in (a) open upward or downward?

Answer:_____

7

14. (5 points) The following table of values does *not* correspond to a linear function.

x	0	2	4	6	8	10
y	18	16	16	14	13	10

Using the method described in class, find **just** the slope of the linear function that approximates the data.

Answer: The slope is: _____

15. Consider the graph of the function

$$f(x) = \frac{x}{(x^2 - 9)}.$$

(a) (3 points) Find its *horizontal* asymptote, if there is one.

Answer:_____

(b) (3 points) Find its *vertical* asymptote(s), if there are any.

Answer:_____

16. (5 points) The line $x = -2$ is a vertical asymptote for the function

$$g(x) = \frac{x^2 + 6}{x + 2}.$$

Determine the behavior of the graph (i.e. positive or negative) as it approaches the asymptote from either side.

Answer: From the right the graph is _____

From the left the graph is _____

17. Let $f(x) = x^{\left(-\frac{3}{2}\right)}$.

(a) (4 points) What is the domain of f?

Answer:_____

(b) (2 points) What is $f(9)$? (Express your answer as a *fraction*, not as a decimal.)

Answer:_____

9

18. The following tables give values from three functions. One function is linear, one is exponential, and one is neither.

I.

x	0	1	2	3	4	5
$f(x)$	6	12	24	48	96	192

II.

x	0	1	2	3	4	5
$g(x)$	8	20	50	100	160	220

III.

x	0	1	2	3	4	5
$h(x)$	5	7.3	9.6	11.9	14.2	16.5

(a) (5 points) Determine which function is linear, which is exponential, and which is neither.

Answer: Table I. is _____

Table II. is _____

Table III. is _____

(b) (3 points) Find a formula $y = Ab^x$ for the exponential function.

Answer:_____

10

19. (5 points) According to a recent *Headline News* broadcast, the cost of education at a state school may be as high as $100,000 eighteen years from now.

    Suppose the parents of a newborn want to put some money away today for their child's education. If their savings account pays simple interest figured annually at a rate of 5%, how much should they contribute now in order to have $100,000 in 18 years?

Answer:⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯