Math 150: Summer 2011

Test 2, Form: A

Name: _____

Read all of the following information before starting the exam:

- It is to your advantage to answer ALL of the questions.
- There are 18 multiple choice and 2 short answer problems on this test. It is your responsibility to make sure that you have all of the problems. There are some BONUS questions at the end.
- Each problem is worth 5 points. There is no partial credit given on the multiple choice problems.
- There is no need to complete the test in order. The problems are independent.
- *Budget your time!*
- If you have read all of these instructions, remember that I am thinking of the number three.

1. For $f(x) = 2x - 3$ and $g(x) = 2x^2$, find $\left(\frac{f}{g}\right)(3)$.

   (a) -3

   (b) 6

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

   (d) $\frac{1}{6}$

   (e) None of the above.

2. Find the domain of $f(x) = \dfrac{2x}{x^2 + 1}$ in interval notation.

   (a) $(-\infty, \infty)$

   (b) $(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$

   (c) $(-\infty, 0) \cup (0, \infty)$

   (d) $(-1, 1)$

   (e) None of the above.

3. Find the difference quotient of f; that is find $\dfrac{f(x+h) - f(x)}{h}$, where

$$f(x) = 4x + 3.$$

   (a) 1

   (b) $-\frac{3}{4}$

   (c) 3

   (d) 4

   (e) None of the above.

4. Let $P(y) = 0.033y^2 - 3.069y + 266.610$ represent the population (in millions) of people in 2005 that were y years of age or older. Give a correct interpretation of the statement $P(60) = 201.270$.

   (a) There were 60 million people in 2005 who were 201.270 years old.

   (b) There were 201.270 million people in 2060.

   (c) There were 201.270 million people who were 60 years of age or older in 2005.

   (d) There were 201.270 million people who were 60 years old in 2005.

   (e) None of the above.

5. If a rock falls from a height of 28 meters on Earth, the height H in meters after x seconds is approximately

$$H(x) = 28 - 4.9x^2.$$

When does the rock strike the ground? Round to two decimal places.

(a) 1.45 seconds

(b) 2.39 seconds

(c) 3.76 seconds

(d) 2.12 seconds

(e) None of the above.

6. Let $f(x) = \dfrac{x^2 - 2}{x + 4}$. Find the y-intercept of the graph of f, if there is one.

(a) $-\dfrac{1}{2}$

(b) 2

(c) -4

(d) $\sqrt{2}, -\sqrt{2}$

(e) None of the above.

7. Suppose that $g(x) = 3x^2 - 2x + 3$. Find the secant line of containing $(-2, g(-2))$ and $(1, g(1))$ in slope-intercept form.

(a) $y = -5x$

(b) $y = 5x - 3$

(c) $y = -5x + 9$

(d) $y = -15x + 3$

(e) None of the above.

8. Determine algebraically if $h(x) = \dfrac{x}{x^2 - 1}$ is odd, even, or neither.

(a) Odd

(b) Even

(c) Neither

(d) Meatball

(e) None of the above.

9. Find the average rate of change of $f(x) = 2x^2 + 4$ from 1 to 3.

   (a) 5

   (b) 27

   (c) 8

   (d) 16

   (e) None of the above.

10. In the summer of 2009, Duke Energy supplied electricity to residences of Ohio for a monthly charge of \$4.50 plus 4.2345 cents per kWh for the first 1000 kWh supplied in the month and 5.3622 cents per kWh for all usage over 1000 kWh in the month. What is the charge for using 300 kWh in a month. Round to the nearest cent.

    (a) \$1,274.85

    (b) \$1,270.35

    (c) \$12.70

    (d) \$17.20

    (e) None of the above.

11. Let

$$f(x) = \begin{cases} x^3 & \text{if } -2 \leq x < 1, \\ 3x + 2 & \text{if } 1 \leq x \leq 4. \end{cases}$$

    Compute $f(1)$.

    (a) 1

    (b) 5

    (c) 24

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

    (e) None of the above.

12. Where is the function $f(x) = x^2$ increasing?

    (a) $(-\infty, 0)$

    (b) $(0, \infty)$

    (c) $(-1, 1)$

    (d) $(-\infty, \infty)$

    (e) None of the above.

13. Find the function that is finally graphed after the following transformations are applied to the graph of $y = \sqrt{x}$ in the order listed.

    (1) Reflect about the x-axis.

    (2) Reflect about the y-axis.

    (3) Shift up 4 units.

    (a) $y = -\sqrt{-x} - 4$

    (b) $y = -\sqrt{-x - 4}$

    (c) $y = -\sqrt{-x + 4}$

    (d) $y = -\sqrt{-x} + 4$

    (e) None of the above.

14. Write the function that whose graph is the graph of $y = x^3$, but is shifted to the right 4 units and down 3 units.

    (a) $y = (x + 4)^3 - 3$

    (b) $y = (x - 4)^3 - 3$

    (c) $y = 4x^3 + 3$

    (d) $y = (4x)^3 - 3$

    (e) None of the above.

15. If $(3, 3)$ is a point on the graph of $y = f(x)$, which of the following points must be on the graph of $y = 2f(3x)$?

    (a) $(3, -3)$

    (b) $\left(9, \frac{3}{2}\right)$

    (c) $(9, 6)$

    (d) $(1, 6)$

    (e) None of the above.

16. A wire of length x is bent into the shape of a circle. Express the circumference C as a function of x and give the domain of C.

    (a) $C(x) = x$ with domain $(0, \infty)$

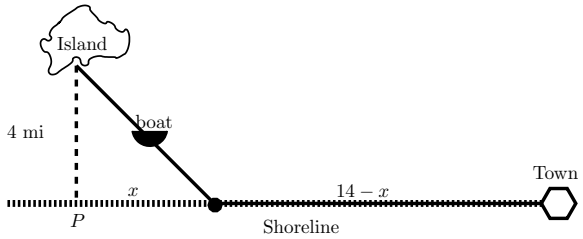
    (b) $C(x) = 2\pi x$ with domain $(0, \infty)$

    (c) $C(x) = \pi x^2$ with domain $(-\infty, \infty)$

    (d) $C(x) = \frac{x}{2\pi}$ with domain $(0, \pi]$

    (e) None of the above.

17. An island is 4 miles from the nearest point P on a straight shoreline. A town is 14 miles down the shore from P. If a Bob can row a boat an average of 2 miles per hour and he can walk 5 miles per hour, express the time T that it takes for Bob to go from the island to town as a function of the distance x from P to where he lands the boat.



(a) $T(x) = 78$

(b) $T(x) = \dfrac{\sqrt{4^2 + x^2}}{2} + \dfrac{14 - x}{5}$

(c) $T(x) = 2\sqrt{4^2 + x^2} + 5(14 - x)$

(d) $T(x) = \dfrac{\sqrt{4^2 + (14 - x)^2}}{2} + \dfrac{x}{5}$

(e) None of the above.

18. What is brown and sticky?

(a) Caramel

(b) Molasses

(c) A stick

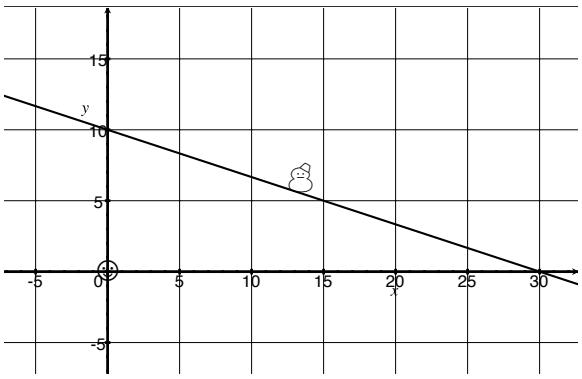
(d) An elephant

(e) None of the above.

19. You spot Bigfoot walking in a straight path in a field. His trajectory can be modelled by

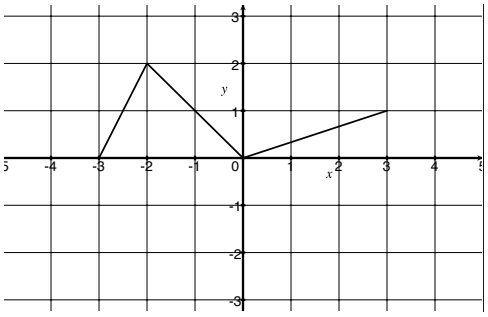
$$y = -\frac{1}{3}x + 10,$$

where you are hiding at the origin, and x is measured in feet. See the figure below. You hope to take a picture of him when he is as close to you as possible. Express the distance D of Bigfoot from you as a function of x.



$D(x) =$ ____

20. Suppose the graph of f is given below. On the same axes, sketch a graph of $y = f(x+1) - 3$.



21. BONUS (1 extra point): I am thinking of a number between 1 and 1,000,000. What number am I thinking of?

22. BONUS (1 extra point): To which MAT 150 student should you wish a Happy Birthday today?

Answer Key for Exam A

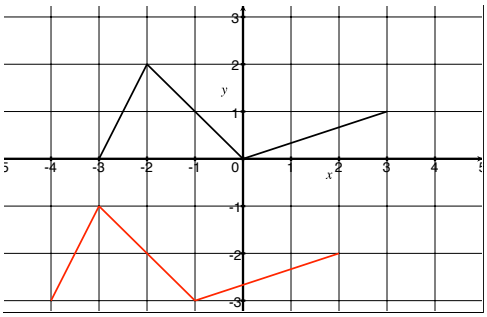
1. (d)
2. (a)
3. (d)
4. (c)
5. (b)
6. (a)
7. (c)
8. (a)
9. (c)
10. (d)
11. (b)
12. (b)
13. (d)
14. (b)
15. (d)
16. (a)
17. (b)
18. (c)
19. Recall that the distance from the origin $(0, 0)$ to a point (x, y) is given by

$$D = \sqrt{x^2 + y^2}.$$

Since Bigfoot is walking along the path $y = -\frac{1}{3}x + 10$, we get distance D as

$$D(x) = \sqrt{x^2 + \left(-\frac{1}{3}x + 10\right)^2}$$

20. Notice that the new graph can be constructed by shifting left 1 unit, then shifting down 3 units. We show the graph in red below. [Hint: If you cannot shift the whole graph at once, shift key points such as the endpoints and corners.]



21. 3

22. Abid Naqvi