Exam Format: The exam will be in-person. You will have 75 minutes to complete it. It will have six multiple-choice questions and six short-answer questions, for a total of twelve questions. The multiple-choice questions are worth two points each, and the short-answer questions are worth four points each.

Exam Material: The exam will cover sections 2.1 to 2.8**.** Exam 1 *will not cover* sections 1.8 and 3.1, Solving Inequalities and Quadratic Functions. The table below includes a detailed list of learning objectives, definitions, and practice problems.

Exam Rules:

Please bring: A pencil, your CCNY ID card, your EMPLID

Prohibited Items: Notes, Textbooks, Calculators, Phones, Smart Watches, and all Electronic Devices. You cannot communicate with anyone else during the exam except your instructor if you have a question.

*If a student uses one of the prohibited items during the exam, it will be considered a violation of the academic honesty policy and reported to the Office of Academic Standards. All electronic devices should be turned off and put away out of sight.

You should review quizzes 13, 14, 15 and 16. The solutions are posted on djohn.math.com, under math190 section K.

Also review Web Assign HW from sections 2.1 to 2.8

Topic	Sec	Learning Objectives: (You should be able to)
Functions	2.1	- Use Function Notation - Find the value of a Function (Evaluating a Function) - Understand what is a piecewise defined function - Find the Net Change of Function - Find the Difference Quotient of a Function - Find the Domain of a Function
Graphs of Functions	2.2	- Graphing Functions by making a table and plotting points - Identify the Graph of a Function - Use the Vertical Line Test - Graphing Piecewise Defined Functions
Getting Information from the Graph of a Function	2.3	- Obtain Information from or about the Graph of a Function - Find the Domain and Range from the Graph of a Function - Use a Graph to Determine Where a Function is Increasing and Decreasing - Use a Graph to Locate Local Maxima and Local Minima
Average Rate of Change	2.4	- Find the Average Rate of Change of a Function - Find the Average Rate of Change of a Linear Function. (Linear Functions have a constant rate of change).
Transformation of Functions	2.6	- Graph Functions Using Vertical Shifts - Graph Functions Using Horizontal Shifts - Graph Functions Using Reflections about the x-axis and y-axis
Composition of Functions	2.7	- Form a Composite Function - Find the Domain of a Composite Function
One-to-One Functions and Their Inverses	2.8	- Determine Whether a Function is One-to-One Graphically (Use the Horizontal Line Test) - Find the Inverse Function Defined by an Equation - Verify an Inverse Function (Use the Inverse Function Property) - Obtain the Graph of the Inverse Function from the Graph of a One-to-One Function

Answer all 23 questions. For the multiple questions no partial credit will be allowed. For short answer questions partial credit will be given. Utilize the information provided for each question to determine your answer. Record your answers on your on the line.

1. Given $f(x) = -3x^2 + 10$, find $f(-2)$.

      A. -26

      B. -2

      C. 22

      D. 46

      E. none of the above

1. _____

2. If $f(x) = x^2 + 3x$, then which statement is true?

      A. $f(1) = f(-1)$

      B. $f(2) = f(-2)$

      C. $f(1) = f(2)$

      D. $f(-1) = f(-2)$

      E. none of the above

2. _____

3. Find the domain of the function $f(x) = x^2 + x - 12$.

      A. $(-\infty, -4]$

      B. $(-\infty, \infty)$

      C. $[-4, 3]$

      D. $[3, \infty)$

      E. none of the above

3. _____

4. Find the domain of the function $f(x) = -\frac{3}{\sqrt{2-x}}$.

      A. $(2, \infty)$

      B. $(-\infty, 2)$

      C. $(-\infty, 2) \cup (2, \infty)$

      D. $(-2, 2)$

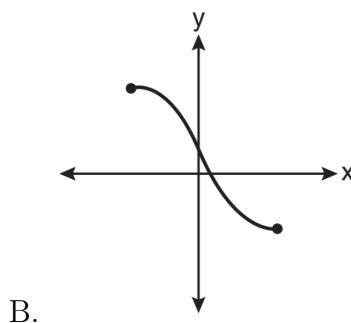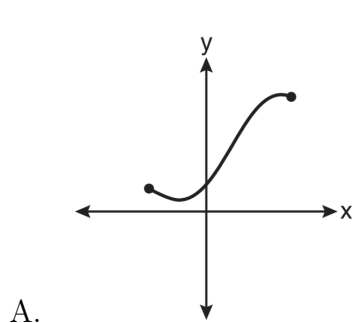   E. none of the above

4. _____

5. Let $f(x) = 4x^2 - x + 1$. Find $f(a+1)$.

      A. $4a^2 - a + 6$

      B. $4a^2 - a + 4$
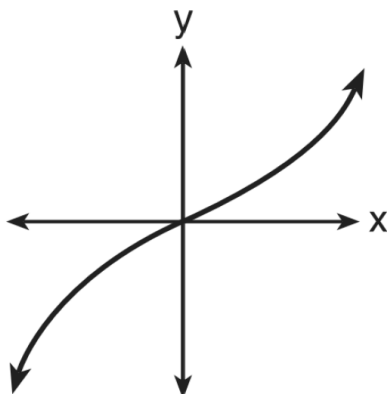
      C. $4a^2 + 7a + 6$

      D. none of the above

      E. $4a^2 + 7a + 4$

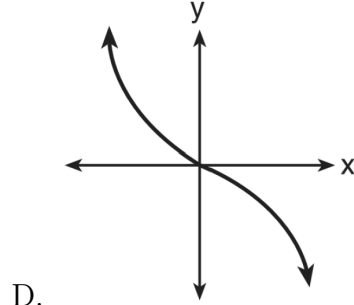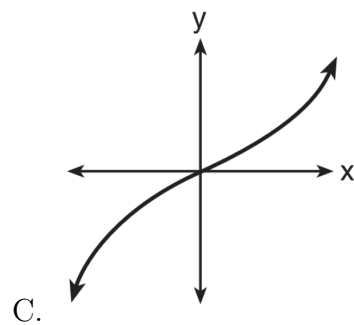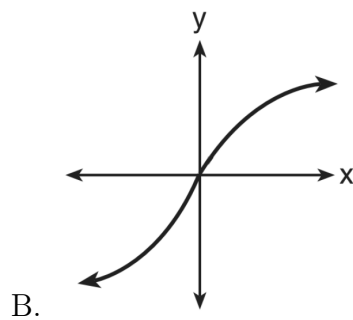5. _____

6. Which graph does *not* represent a function?
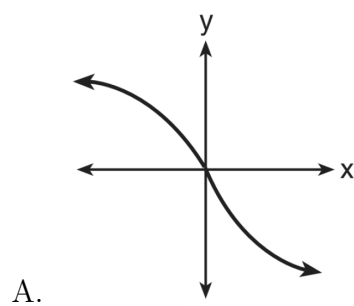

A.

B.

C.

D.
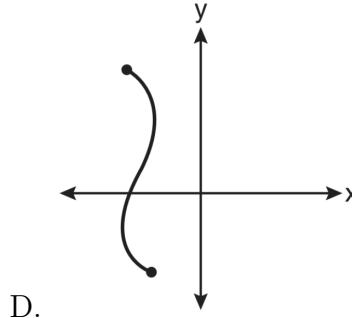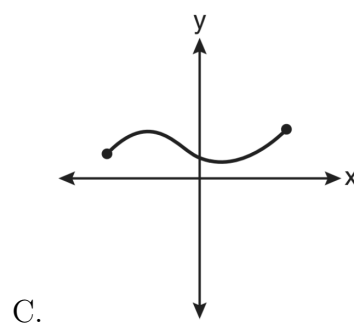
E. none of the above

6. _____

7. The graph below represents $f(x)$.
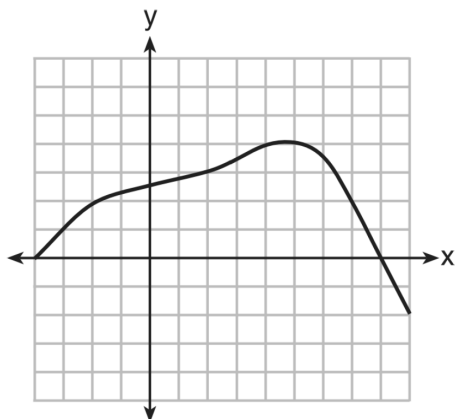

Which graph represents $f(-x)$?
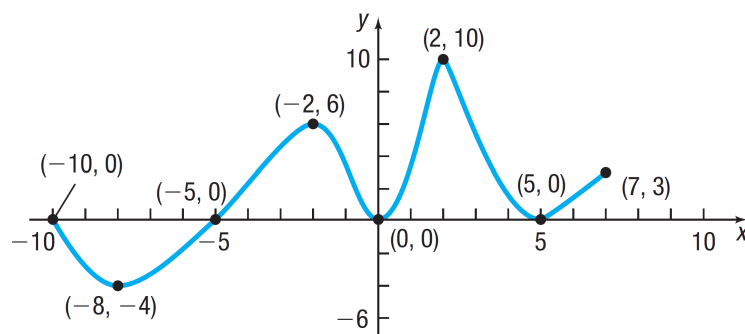

A.

B.

C.

D.

E. none of the above

7. _____

8. Which value is in the domain of the function graphed below, but *not* in its range?

A. 0

B. 2

C. 3

D. 7

E. none of the above

8. _____

9. Use the graph below of the function f to answer each question?

(a) Is f increasing on the interval $[-8, -2]$?

(b) Is f decreasing on the interval $[-8, -4]$?

(c) List the interval(s) on which f is increasing.

(d) List the interval(s) on which f is decreasing.

(e) Is there a local maximum at 2? If yes, what is it?

(f) Is there a local maximum at 5? If yes, what is it?

(g) List the number(s) at which f has a local maximum. What are the local maximum values?

(h) List the number(s) at which f has a local minimum. What are the local minimum values?

(i) What is the domain of f? Express your answer using interval notation.

(j) What is the range of f? Express your answer using interval notation.

10. Find the Average Rate of Change of the function $f(x) = mx + b$ on the interval $[c, c+h]$

10. _____

11. Write a function formula for the transformation of $y = f(x)$ that moves the graph 7 units to the left and 3 units down?
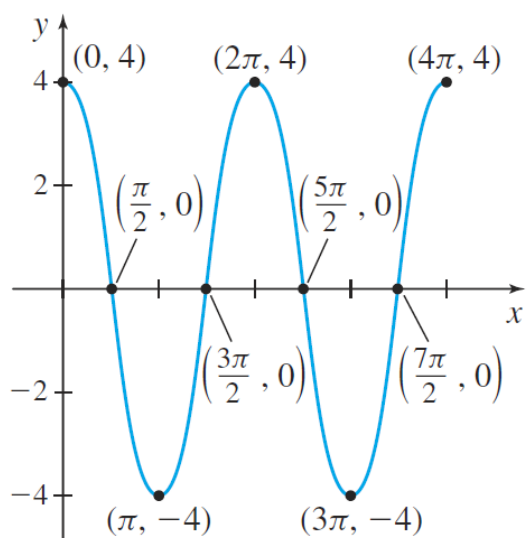
11. _____

12. Find the inverse function of $f(x) = 3 - 7x$ and find $f^{-1}(-32)$.
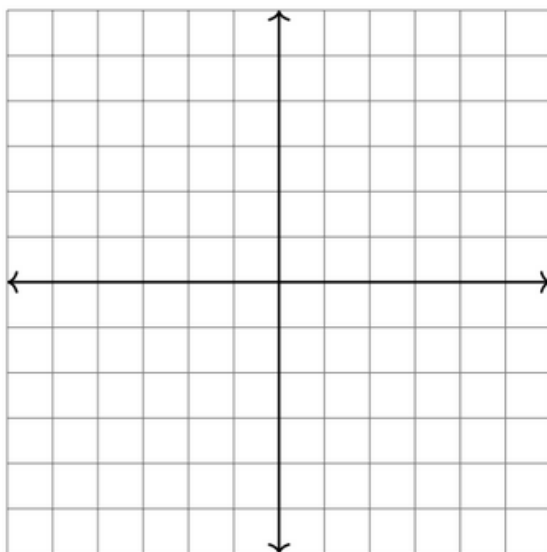
12. _____

13. Evaluate and simplify $f(1 + h) - f(1)$ when $f(x) = 2x - 2x^2$.

13. _____

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

Using the graph of f, sketch the graph of $f(x) + 1$.

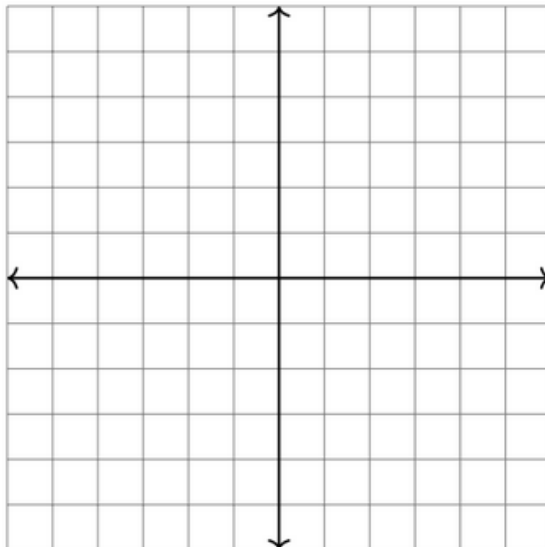15. Let $f(x) = 2x + 2$ and $g(x) = 1 - x^2$. Find $(g \circ f)(x)$.

15. _____

16. Use the table to find $g(f(2))$.

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

16. _____

17. Sketch the graph of

$$h(x) = \begin{cases} 3 & \text{if } x < 2 \\ -x + 3 & \text{if } x \geq 2 \end{cases}$$
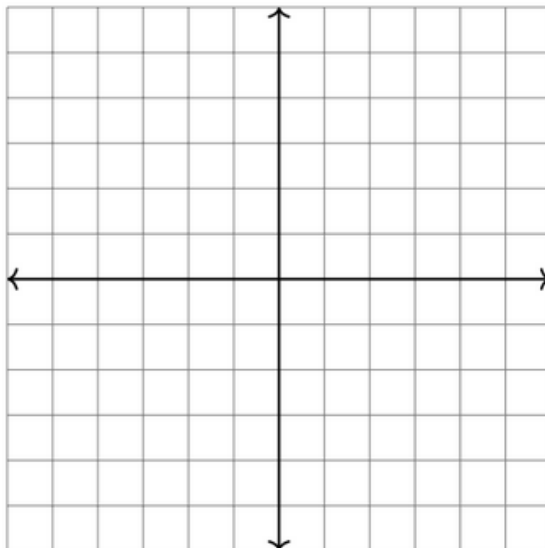
18. Use the graph below to find $g^{-1}(5)$.
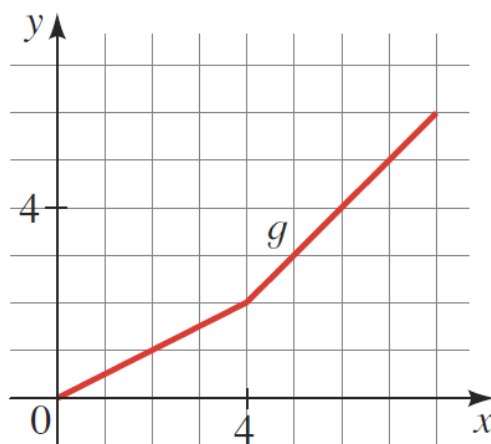
18. _____

19. Sketch the graph of $T(x) = -|x - 5|$.

20. Find the net change of $f(x) = \frac{3}{x}$ between $x = -\frac{1}{9}$ and $x = \frac{1}{3}$.

20. _____

21. Find the average rate of change of $f(x) = 5x^2$ on the interval $[3, 5]$.

21. _____

22. If $f(x) = 3x^2$ and $g(x) = \sqrt{2x}$, find $f(g(8))$.

    A. $8\sqrt{6}$

    B. 16

    C. 48

    D. none of the above

    E. 144

22. _____

23. If the point (a, b) lies on the graph of $y = f(x)$, the graph of $y = f^{-1}(x)$ must contain the point

    A. (b, a)

    B. $(a, 0)$

    C. $(0, b)$

    D. none of the above

    E. $(-a, -b)$

23. _____