

BARUCH COLLEGE  
MATH 2001, DAY, FORM A, PART 1

NAME: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

INSTRUCTOR/SECTION: \_\_\_\_\_

**PART 1: You are NOT ALLOWED TO USE A CALCULATOR on this part of the exam.****DIRECTIONS:** Write your name and instructor/section number on the line above and sign your name.

All exams are hand-graded by the instructor as well as machine graded, and the scores are compared. Students **MUST SHOW ALL WORK** in the area provided next to each problem. Students who do **NOT** provide supporting work **WILL NOT** receive credit for the problem.

Problems 1 – 18 are multiple choice. **CIRCLE** your answer (A, B, C, D, or E) and **MARK** your answer on the Scantron sheet.

Problems 19 – 24 are free response problems. **WRITE** your answer in the blank space to the right of the problem statement.

You will have 90 minutes to complete Part 1. When you are finished with Part 1, also enter your answers on the Scantron sheet. After 90 minutes, the proctor will take this part of the exam from you and give you Part 2, which consists of 10 additional problems. You will keep the Scantron sheet.

**NO ANSWERS MAY BE CHANGED ON THE SCANTRON FOR PART 1 ONCE THIS EXAM HAS BEEN COLLECTED.**

1. Which of the following is an EVEN function?

1. \_\_\_\_\_

(A)  $f(x) = \tan x + 6$

(B)  $f(x) = 8x - \cos x$

(C)  $f(x) = 3 \sin x + x^2$

(D)  $f(x) = 4x^5 - 6x^2$

(E)  $f(x) = 5|x| - 1$

2. Let  $f(x) = 2x^2 - x$ . Evaluate  $\frac{f(3+h) - f(3)}{h}$  for  $h \neq 0$ .

2. \_\_\_\_\_

(A)  $2h + 13$

(B)  $2h - 1$

(C)  $h - 1$

(D)  $2h + 11$

(E)  $2h + 1$

3. Find the domain of

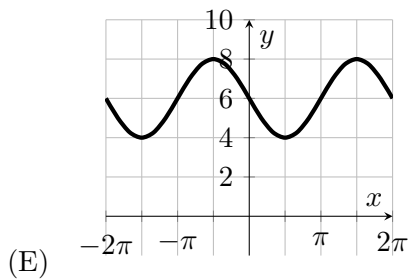
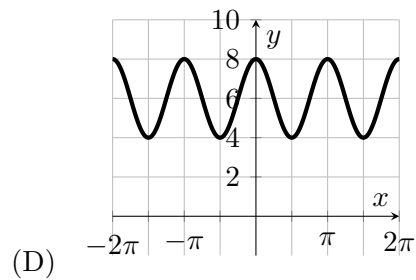
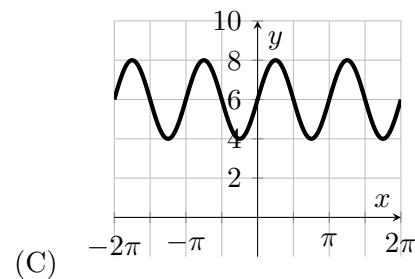
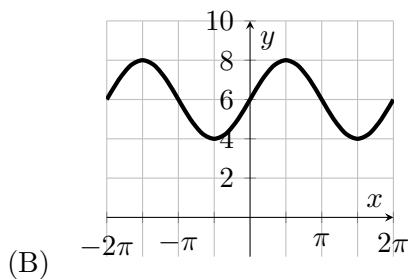
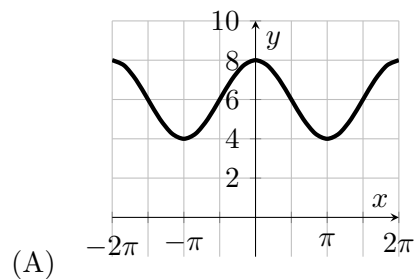
$$f(x) = \frac{-10}{\sqrt{3-x}}$$

3. \_\_\_\_\_

- (A)  $(-\infty, 3]$       (B)  $(-\infty, 3)$       (C)  $(-\infty, 3) \cup (3, \infty)$   
 (D)  $[-10, \infty)$       (E)  $[3, \infty)$

4. Let  $f(x) = 6 + 2 \sin x$ . Which of the following could be the graph of  $y = f(x)$ ?

4. \_\_\_\_\_



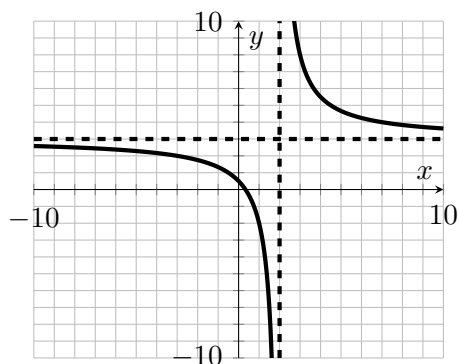
5. The number of students attending a tutoring program grows linearly. The initial number of students in the program is 12. After 3 weeks, the number of students in the program is 30. Which of the following models the number of students in the program,  $N$ , as a function of number of weeks  $t$ ?

5. \_\_\_\_\_

- (A)  $N(t) = -6t + 12$       (B)  $N(t) = 6t + 30$       (C)  $N(t) = 10t + 12$   
 (D)  $N(t) = 6t + 12$       (E)  $N(t) = 10t + 12$

6. The graph of a rational function is depicted below:

6. \_\_\_\_\_



Which of the following functions could have the graph depicted above?

- (A)  $f(x) = \frac{3x - 1}{x - 2}$       (B)  $f(x) = \frac{3x - 3}{3x - 6}$       (C)  $f(x) = \frac{x - 1}{3x + 6}$   
 (D)  $f(x) = \frac{3x - 6}{x + 3}$       (E)  $f(x) = \frac{x - 2}{x + 3}$

7. Suppose  $\sin \theta = \frac{1}{5}$  where  $\frac{\pi}{2} < \theta < \pi$ . Find  $\cos \theta$ . 7. \_\_\_\_\_

- (A)  $\frac{\sqrt{24}}{5}$       (B)  $\frac{-\sqrt{24}}{5}$       (C)  $\frac{-1}{5}$       (D)  $\frac{1}{5}$       (E)  $\frac{-1}{\sqrt{24}}$

8. At a certain beach, the height of the ocean tide  $H$  (in feet) at time  $t$  hours after 12 : 00 a.m. is given by 8. \_\_\_\_\_

$$H(t) = 8 + 3 \sin \left( \frac{\pi}{6}t - \frac{\pi}{3} \right).$$

Find the minimum height and the maximum height.

- (A) Minimum: 5 feet, Maximum: 8 feet  
(B) Minimum: 3 feet, Maximum: 8 feet  
(C) Minimum: 3 feet, Maximum: 6 feet  
(D) Minimum: 8 feet, Maximum: 11 feet  
(E) Minimum: 5 feet, Maximum: 11 feet

9. Let  $f(x) = 5x^3 + 2$ . find the inverse function,  $f^{-1}(x)$ .

9. \_\_\_\_\_

(A)  $\frac{2}{5x^3}$       (B)  $\sqrt[3]{\frac{x-2}{5}}$       (C)  $\sqrt[3]{\frac{1}{5}x + \frac{1}{2}}$

(D)  $\frac{1}{5}(x-2)^3$       (E)  $\frac{5}{2x^3}$

10. Write the quadratic function

10. \_\_\_\_\_

$$y = 2x^2 - 12x + 19$$

in standard form.

(A)  $y = 2(x+1)^2 - 3$       (B)  $y = (x-2)^2 + 19$       (C)  $y = 2(x-3)^2 + 1$

(D)  $y = 2(x+3)^2 - 1$       (E)  $y = 2(x-4)^2 + 19$

11. Solve the inequality

$$x^5 - 9x^4 < 0.$$

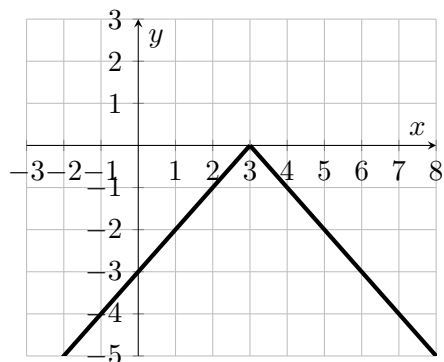
11. \_\_\_\_\_

Write your answer in interval notation.

- (A)  $(0, 9)$                       (B)  $(-\infty, 0) \cup (9, \infty)$                       (C)  $(-\infty, 9)$   
 (D)  $(-\infty, 0) \cup (0, 9)$                       (E)  $(9, \infty)$

12. Suppose  $g(x)$  is a transformation of the function  $f(x) = |x|$ . The graph of  $y = g(x)$  is depicted below:

12. \_\_\_\_\_



Which of the following is a functional equation for  $g(x)$ ?

- (A)  $g(x) = |x + 3|$                       (B)  $g(x) = |x - 3|$                       (C)  $g(x) = -|x - 3|$   
 (D)  $g(x) = -|x| + 3$                       (E)  $g(x) = |x| - 3$

13. Assuming  $0 < x < \frac{\pi}{2}$ , which of the following is equivalent to  $\frac{\sec x \tan x}{\sin x}$ ? 13.\_\_\_\_\_

(A)  $\sec x$       (B)  $\tan^2 x$       (C)  $\sec^2 x$

(D)  $\cos^2 x$       (E)  $\csc x$

14. Find ALL real zeros of the polynomial  $f(x) = x^4 - 7x^2 + 6$ . 14.\_\_\_\_\_

(A)  $x = -\sqrt{6}$ ,  $x = -1$ ,  $x = 1$ , and  $x = \sqrt{6}$

(B)  $x = -\sqrt{7}$ ,  $x = -1$ ,  $x = 1$ , and  $x = \sqrt{7}$

(C)  $x = -\sqrt{7}$ ,  $x = -\sqrt{6}$ ,  $x = \sqrt{6}$ , and  $x = \sqrt{7}$

(D)  $x = 1$  and  $x = \sqrt{6}$  only

(E)  $x = 1$  and  $x = \sqrt{7}$  only



15. Which of the following statements is true concerning the graph of  $y = e^x$ ? 15.\_\_\_\_\_

- (A) The graph of  $y = e^x$  has a  $y$ -intercept at  $(0, 0)$ .
- (B) The graph of  $y = e^x$  has a vertical asymptote at  $x = 1$ .
- (C) The graph of  $y = e^x$  has a vertical asymptote at  $x = 0$ .
- (D) The graph of  $y = e^x$  has a horizontal asymptote at  $y = 1$ .
- (E) The graph of  $y = e^x$  has a horizontal asymptote at  $y = 0$ .

16. Which of the following expressions is equivalent to  $\log\left(\frac{3x^7}{y^8\sqrt{z}}\right)$ ? 16.\_\_\_\_\_

- (A)  $3\log(7x) - \log(8y) - \log\left(\frac{1}{2}z\right)$
- (B)  $\log 3 + 7\log x - 8\log y + \frac{1}{2}\log z$
- (C)  $\log 3 + 7\log x - 8\log y - 2\log z$
- (D)  $\log 3 + 7\log x - 8\log y - \frac{1}{2}\log z$
- (E)  $\log 3 + \log(7x) - \log(8y) - \log\left(\frac{1}{2}z\right)$

17. Find all solutions in the interval  $[0, 2\pi]$ :

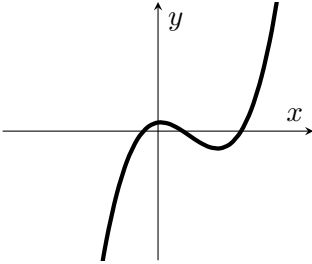
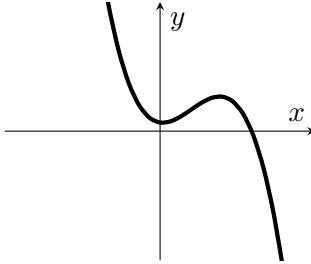
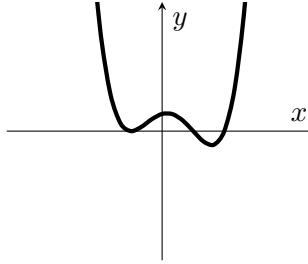
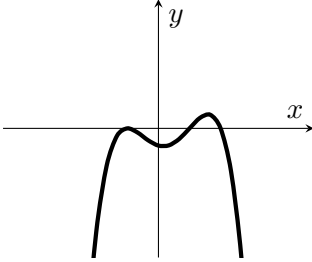
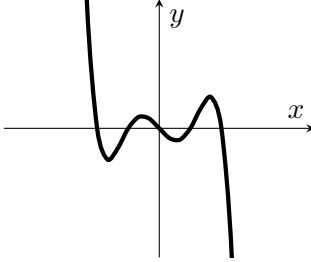
17. \_\_\_\_\_

$$\tan^2 x - 3 = 0.$$

- (A)  $x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$       (B)  $x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$       (C)  $x = \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$   
 (D)  $x = \frac{\pi}{3}, \frac{5\pi}{6}, \frac{4\pi}{3}, \frac{11\pi}{6}$       (E)  $x = \frac{\pi}{6}, \frac{2\pi}{3}, \frac{7\pi}{6}, \frac{5\pi}{3}$

18. Which of the following COULD be the graph of  $y = -2x^3 + 6x^2 - x + 2$ ?

18. \_\_\_\_\_

- (A) 
- (B) 
- (C) 
- (D) 
- (E) 

19. Let

$$f(x) = \sqrt{2x + 1}$$

19. \_\_\_\_\_

and

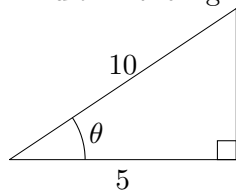
$$g(x) = 5x - 6.$$

Evaluate  $f(g(2))$ .

Write your answer as an integer or fraction in lowest terms.

20. Find  $\theta$  in the right triangle below:

20. \_\_\_\_\_

Write your answer as an integer in degrees.

21. The profit  $P$ , in dollars, obtained from producing  $x$  units of a product is 21.\_\_\_\_\_

$$P(x) = -10x^2 + 40x - 10.$$

Find the maximum *profit*.

Write your answer as an integer or fraction in lowest terms.

22. Find the ONE solution to the equation: 22.\_\_\_\_\_

$$\log_2(x - 3) + \log_2(x - 4) = 1.$$

Write your answer as an integer or fraction in lowest terms.

23. Solve for  $x$ :

$$2^{5x+1} = \sqrt{8^{2x-3}}.$$

23. \_\_\_\_\_

Write your answer as an integer or fraction in lowest terms.

24. Evaluate each of the following.

(a)  $\cos\left(\frac{3\pi}{2}\right)$

24(a). \_\_\_\_\_

(b)  $\csc(210^\circ)$

24(b). \_\_\_\_\_

(c)  $\tan\left(\frac{-3\pi}{4}\right)$

24(c). \_\_\_\_\_

BARUCH COLLEGE  
MATH 2001, DAY, FORM A, PART 2

NAME: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

INSTRUCTOR/SECTION: \_\_\_\_\_

**PART 2: You ARE allowed to use a calculator on this part of the exam.****DIRECTIONS:** Write your name and instructor/section number on the line above and sign your name.

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Problems 101 – 106 are multiple choice. **CIRCLE** your answer (A, B, C, D, or E) and **MARK** your answer on the Scantron sheet as Problems 101 through 106 on the **BACK** of your Scantron.

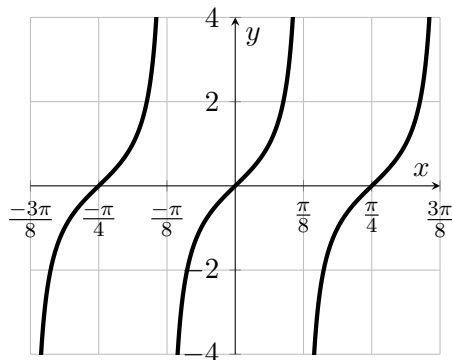
Problems 107 – 110 are free response problems. **WRITE** your answer in the blank space underneath the problem statement.

You will have 30 minutes to complete Part 2.

101. An observer at sea level is 2 miles away from a mountain. The observer looks to the top of the mountain with an angle of observation of  $65^\circ$ . Find the height of the mountain in miles above sea level. Round your answer to the nearest hundredth.  
**HINT:** Start by sketching a picture.

(A) 3.17      (B) 3.79      (C) 4.29      (D) 4.86      (E) 5.23

102. The graph of  $y = \tan(Ax)$  is depicted below for some constant  $A$ .



What is  $A$ ?

(A) 2      (B) 4      (C)  $\frac{1}{2}$       (D) 8      (E)  $\frac{1}{4}$

103. Find the equation of the line **perpendicular** to  $4x + 7y = 3$  passing through the point  $(8, -5)$ . 103. \_\_\_\_\_

(A)  $y = \frac{-7}{4}x + \frac{3}{4}$       (B)  $y = \frac{-7}{4}x + 9$       (C)  $y = \frac{7}{4}x - 9$   
(D)  $y = \frac{7}{4}x - 19$       (E)  $y = \frac{1}{4}x - 7$

104. Solve for  $x$ : 104. \_\_\_\_\_

$$3 \log_5(2x + 7) = -1.$$

Round your answer to the nearest hundredth.

(A)  $-3.21$       (B)  $-2.98$       (C)  $-2.53$       (D)  $-2.39$       (E)  $-2.01$



105. Convert  $\frac{7\pi}{12}$  radians to degrees. 105.\_\_\_\_\_

- (A)  $70^\circ$       (B)  $105^\circ$       (C)  $210^\circ$       (D)  $55^\circ$       (E)  $308^\circ$

106. The population,  $P$ , in a small town is observed to grow exponentially. The initial population is 100. After 7 years, the population has doubled. Find the population after 9 years. 106.\_\_\_\_\_

Round your answer to the nearest integer.

- (A) 221      (B) 230      (C) 244      (D) 261      (E) 278

107. Evaluate  $\log_7(139)$ .

107. \_\_\_\_\_

Round your answer to the nearest HUNDREDTH (two places to the right of the decimal point).

108. The height, in feet, of a projectile at time  $t$  seconds is given by

108. \_\_\_\_\_

$$h(t) = -16t^2 + 70t + 200.$$

At what positive time  $t$  does the projectile reach a height of 200 feet?

Round your answer to the nearest HUNDREDTH (two places to the right of the decimal point).

109. Let  $f(x) = \sqrt{10x - 1}$ . Evaluate  $f^{-1}(13)$ .  
Write your answer as an INTEGER.

109. \_\_\_\_\_

110. Solve for  $x$ :

$$3 \sin x = 8 \cos x$$

where  $0 < x < \frac{\pi}{2}$ . Write your answer in radians.

Round your answer to the nearest HUNDREDTH (two digits to the right of the decimal point).

110. \_\_\_\_\_