

BARUCH COLLEGE
MATH 2003 Practice Final 2, Part 1, NO CALCULATORS

1. The equation of the line through the point $(1, 1)$ with y -intercept 2 is 1. _____
- (A) $y = -x + 2$ (B) $y = x - 2$ (C) $y = 3x - 2$
(D) $y = -3x + 2$ (E) None of the above
2. A taxi driver buys a new car for \$50,000. The car will have a scrap value of \$10,000 after 8 years. Using the straight-line depreciation method, find the value of the car after 4 years. 2. _____
- (A) \$10,000 (B) \$13,000 (C) \$15,000 (D) \$25,000 (E) \$30,000
3. In a study of the relationship between the year and the number of cyclists killed in an accident, scientists applied a regression analysis, but could **not** find any significant linear relation between the two factors. Which of the following is most likely the value of the correlation coefficient? 3. _____
- (A) 0.05 (B) 0.93 (C) -0.91
(D) -1 (E) 1.25
4. What is the domain of the function $f(x) = \frac{1}{\sqrt{1-x^2}}$? 4. _____
- (A) $(-1, 0]$ (B) $(0, 1)$ (C) $(-1, 1)$
(D) $[-1, 1]$ (E) None of the above
5. The vertex of the parabola $f(x) = -x^2 + bx + c$ is $(4, 17)$. What is the value of c ? 5. _____
- (A) 17 (B) 6 (C) 1
(D) 5 (E) -4

6. Which of the following functions has a graph that is symmetric about the origin? (In other words: which one is an *odd* function?) 6._____

(A) $y = x^2$ (B) $y = 3x^2 + 7x$ (C) $y = 2x^3 + 4x^5$
(D) $y = 2x^3 + 1$ (E) None of the above

7. A circle has radius 3, and its center is at the point $(3, -2)$. What is the equation of the circle? 7._____

(A) $(x - 3)^2 + (y + 2)^2 = 9$ (B) $(x + 3)^2 + (y - 2)^2 = 3$ (C) $(x - 9)^2 + (y - 2)^2 = 9$
(D) $(x + 3)^2 + (y + 2)^2 = 3$ (E) $(x - 3)^2 + (y - 2)^2 = 3$

8. The demand function for a product is given by $p + 2x = 100$, and the supply function is given by $p - 3x = 60$. Find the market equilibrium *price*. 8._____

(A) \$68 (B) \$84 (C) \$76
(D) \$80 (E) \$78

9. Find the tangent line to the curve $y = x^{\frac{1}{3}}$ at the point where $x = 27$. 9._____

(A) $y = \frac{1}{9}(x - 27) + 3$ (B) $y = \frac{1}{27}(x - 27) + 3$ (C) $y = \frac{1}{3}(x - 27) + 9$
(D) $y = \frac{1}{27}(x - 9) + 9$ (E) $y = \frac{1}{27}(x - 9) + 3$

10. Consider the function $f(x) = x^6 + x^{-6}$. Calculate $f'(1)$. 10._____

(A) 0 (B) 1 (C) 2 (D) 6 (E) 12

11. Given the following function,

11._____

$$f(x) = \begin{cases} x + 1, & x < 1 \\ 3 - x, & x \geq 1 \end{cases}$$

which of the following statements is **true**?

- (A) $\lim_{x \rightarrow 1^+} f(x) = 3$ (B) $\lim_{x \rightarrow 1^-} f(x) = 1$ (C) $f(x)$ is continuous at $x = 1$
(D) $\lim_{x \rightarrow 1} f(x)$ does not exist (E) $f(x)$ is undefined at $x = 1$

12. Evaluate $\lim_{x \rightarrow +\infty} \frac{5x^3 - 7}{2x^2 - 18}$.

12._____

- (A) 0 (B) $+\infty$ (C) 3 (D) $\frac{7}{18}$ (E) $\frac{5}{2}$

13. Find the vertical asymptote(s) of $y = \frac{2x^2 + 2x}{x^2 - x}$.

13._____

- (A) $x = 2$ only (B) $x = 1$ only (C) $x = 0$ and $x = 1$
(D) $x = 0$ only (E) $x = 0$ and $x = 2$

14. Given the equation $x^2 + y^2 = 9$, calculate $\frac{dy}{dx}$ with implicit differentiation.

14._____

- (A) 0 (B) $2x/y$ (C) x/y
(D) $-x/y$ (E) $-x/2y$

15. If $f(x) = \sqrt[3]{2x^4 + 3x}$, find $f'(x)$.

15._____

- (A) $\frac{1}{3}(8x^3 + 3)^{-2/3}$ (B) $\frac{1}{3}(8x^3 + 3)$ (C) $(8x^3 + 3)(2x^4 + 3x)^{2/3}$
(D) $\frac{1}{3}(8x^3 + 3)(2x^4 + 3x)^{-2/3}$ (E) $\frac{1}{3}(2x^4 + 3x)(8x^3 + 3)^{-2/3}$

16. For which x -values does the graph of $y = x^4 - 4x^3$ have a *horizontal tangent line*? 16._____
- (A) $x = 4$ only (B) $x = 0$ only (C) $x = 0$ and $x = 3$
 (D) $x = 0$ and $x = 4$ (E) $x = 2$ and $x = 4$

17. If $f(x) = \frac{4x^2}{x^2 + 1}$, find $f'(x)$. 17._____
- (A) $\frac{8x}{(x^2 + 1)^2}$ (B) $\frac{-8x}{(x^2 + 1)^2}$ (C) $\frac{4x + 2}{(x^2 + 1)^2}$ (D) $\frac{-4x - 2}{(x^2 + 1)^2}$ (E) $\frac{-8x + 4}{(x^2 + 1)^2}$

18. Air is being pumped into a spherical balloon at a rate of 5 cubic feet per minute. Find the rate of change of the radius when the radius is 3 feet. 18._____
- (The volume of a sphere is given as $V = \frac{4}{3}\pi r^3$.)
- (A) $\frac{20}{3\pi}$ ft./min. (B) $\frac{16}{3\pi}$ ft./min. (C) $\frac{9}{16\pi}$ ft./min. (D) $\frac{5}{4\pi}$ ft./min. (E) $\frac{5}{36\pi}$ ft./min.

19. Given the following matrix equation: 19._____

$$-2X + \begin{pmatrix} 1 & 7 \\ 6 & 5 \end{pmatrix} = \begin{pmatrix} 3 & 9 \\ 12 & 7 \end{pmatrix},$$

find the matrix X .

- (A) $X = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$ (B) $X = \begin{pmatrix} 1 & 0 \\ 3 & 1 \end{pmatrix}$ (C) $X = \begin{pmatrix} -1 & -1 \\ -3 & -1 \end{pmatrix}$
 (D) $X = \begin{pmatrix} -1 & 0 \\ -3 & 1 \end{pmatrix}$ (E) $X = \begin{pmatrix} 1 & 1 \\ 0 & -3 \end{pmatrix}$

20. Compute the matrix product: 20._____

$$\begin{pmatrix} 2 & 0 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 1 & -2 & 1 \\ 0 & 1 & 3 \end{pmatrix}$$

- (A) $\begin{pmatrix} 2 & -3 \\ 4 & -5 \\ -2 & 6 \end{pmatrix}$ (B) $\begin{pmatrix} 2 & -5 & -6 \\ 4 & -2 & -3 \end{pmatrix}$ (C) $\begin{pmatrix} 2 & -4 & 2 \\ 3 & -5 & 6 \end{pmatrix}$
 (D) $\begin{pmatrix} 2 & -6 \\ 5 & -3 \\ -4 & 2 \end{pmatrix}$ (E) The two matrices cannot be multiplied.

21. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, find A^{-1} . 21._____

- (A) $\begin{pmatrix} 4 & -2 \\ -3 & 1 \end{pmatrix}$ (B) $\begin{pmatrix} -1 & 3 \\ 2 & -4 \end{pmatrix}$ (C) $\begin{pmatrix} -2 & 1 \\ 3/2 & -1/2 \end{pmatrix}$
 (D) $\begin{pmatrix} 1/2 & -3/2 \\ -1 & 2 \end{pmatrix}$ (E) $\begin{pmatrix} -3/2 & 1/2 \\ -2 & 1 \end{pmatrix}$

22. The augmented matrix below represents a system of equations in the variables (x, y, z) . What is the solution of the system? 22._____

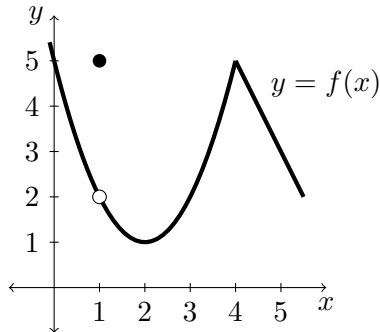
$$\left(\begin{array}{cccc} 1 & 0 & 3 & 1 \\ 0 & 1 & -1 & 5 \\ 0 & 0 & 0 & 0 \end{array} \right)$$

- (A) $(1, 5, k)$ for any real number k
 (B) $(1 - 3k, 5 + k, k)$ for any real number k
 (C) $(3 + k, -1 - 5k, k)$ for any real number k
 (D) $(3 - k, -1 + 5k, k)$ for any real number k
 (E) Inconsistent system, no solution

23. If $f(x) = 2x^2 + 3x$, simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$ (for $h \neq 0$). 23._____

- (A) $4x + h + 3$ (B) $4x + 3$ (C) 1 (D) $4x + 2h + 3$ (E) $4h + 3$

24. Part of the graph of a function $f(x)$ is shown below: 24._____



For which values of x between 0 and 5 is $f(x)$ **not** differentiable?

- (A) $x = 1$ only (B) $x = 4$ only (C) $x = 1$ and $x = 4$
 (D) $x = 2$ and $x = 4$ (E) $x = 1, x = 2$ and $x = 4$

25. The cost, in dollars, of producing x radios is given by $C(x) = x^3 + 20x + 1200$. Find the marginal cost when $x = 10$. 25._____

- (A) 3120 (B) 140 (C) 320
 (D) 20 (E) 0

BARUCH COLLEGE
MATH 2003, Practice Final 2, Part 2, CALCULATORS ALLOWED

26. The monthly cost of driving a car depends on the number of miles driven. Jack found that in one month, it cost him \$236 to drive 200 miles; and in another month, it cost him \$445 to drive 400 miles. Determine the cost if he drives 327 miles in a month, assuming that a linear relationship gives a suitable model. 26._____
- (A) \$368.72 (B) \$343.74 (C) \$334.32
(D) \$123.71 (E) \$489.15
27. A manufacturer has fixed costs of \$43, a cost per item for production of \$7, and expects to sell 29 items. At what **price** will the manufacturer break even? 27._____
- (A) \$8.12 (B) \$8.48 (C) \$3.38
(D) \$5.23 (E) \$12.38
28. At what x value is the slope of the graph of $f(x) = 3x^4 + x^2$ equal to -1.7 ? Round your answer to three decimal places. 28._____
- (A) $x = -0.216$ (B) $x = -0.416$ (C) $x = 0.483$
(D) $x = -0.454$ (E) No solution.
29. Find the linear regression equation for the following data set: 29._____
- | | | | | | |
|-----|----|----|----|---|----|
| x | -7 | -5 | -1 | 2 | 6 |
| y | 11 | 8 | 6 | 2 | -4 |
- (A) $y = -1.1845x + 3.5565$ (B) $y = 3.0235x + 3.5332$ (C) $y = -5.2013x + 3.3589$
(D) $y = -1.0909x + 3.5091$ (E) $y = -1.5483x + 3.1254$
30. A food market sells tomatoes at a price of \$1.32 per pound. The cost is given by the equation $C(x) = 0.11x^2 + 0.31x - 1.65$, where x is the number of pounds sold. Compute the maximum possible *profit* from selling tomatoes. 30._____
- (A) \$3.97 (B) \$4.34 (C) \$5.12
(D) \$6.44 (E) \$12.45

31. The position $s(t)$ of a particle at time t is given by the equation $s(t) = 2t^4 - t^2 - t + 1$, for $t > 0$. At what time(s) does its velocity become zero? 31._____

(A) 0.54 (B) 0.54 and 0.63 (C) 1.17 and 0.54 and 0.63
 (D) 1.17 and 0.54 (E) 0.66

32. Find a matrix X such that the equation $AX = B$ holds, where 32._____

$$A = \begin{pmatrix} 4 & 5 \\ 2 & 0 \end{pmatrix} \quad \text{and} \quad B = \begin{pmatrix} 3 & 6 \\ 1 & 8 \end{pmatrix}.$$

(A) $\begin{pmatrix} 3/5 & -11/10 \\ 2/5 & -37/10 \end{pmatrix}$ (B) $\begin{pmatrix} 7/2 & 2 \\ 2/5 & -1 \end{pmatrix}$ (C) $\begin{pmatrix} 6/5 & -9/10 \\ 8/5 & -27/10 \end{pmatrix}$
 (D) $\begin{pmatrix} 1/2 & 4 \\ 1/5 & -2 \end{pmatrix}$ (E) $\begin{pmatrix} 17 & 64 \\ 6 & 12 \end{pmatrix}$

33. Find $\lim_{h \rightarrow 0} \frac{(0.7 + h)^9 - 0.7^9}{h}$. 33._____

(A) -0.6869 (B) 0.1425 (C) 0.5188
 (D) 0.9453 (E) 0.7364

34. Find the average rate of change of the function $f(x) = 3x^4 - 5x^2$ over the interval $[1.1, 2.4]$. Round your answer to two decimal places. 34._____

(A) 63.20 (B) 72.39 (C) 105.32
 (D) 136.92 (E) 55.69

35. Find the solution to the linear system: 35._____

$$\begin{cases} 5x + 5y - 7z = 3 \\ 2y - 5z = 1 \\ 4x + 3z = 3 \end{cases}$$

(A) $x = \frac{15}{7}, y = -\frac{29}{7}, z = -\frac{13}{7}$
 (B) $x = \frac{2}{7}, y = -\frac{15}{7}, z = \frac{22}{7}$
 (C) $x = -\frac{8}{7}, y = -\frac{10}{7}, z = \frac{16}{7}$
 (D) No solution
 (E) Infinitely many solutions

1. A
2. E
3. A
4. C
5. C
6. C
7. A
8. B
9. B
10. A
11. C
12. B
13. B
14. D
15. D
16. C
17. A
18. E
19. C
20. C
21. C
22. B
23. D
24. C
25. C
26. A
27. B
28. B
29. D
30. A
31. E
32. D
33. C
34. E
35. A