

BARUCH COLLEGE
MATH 2207 Practice Final 1, Part 1, NO CALCULATORS

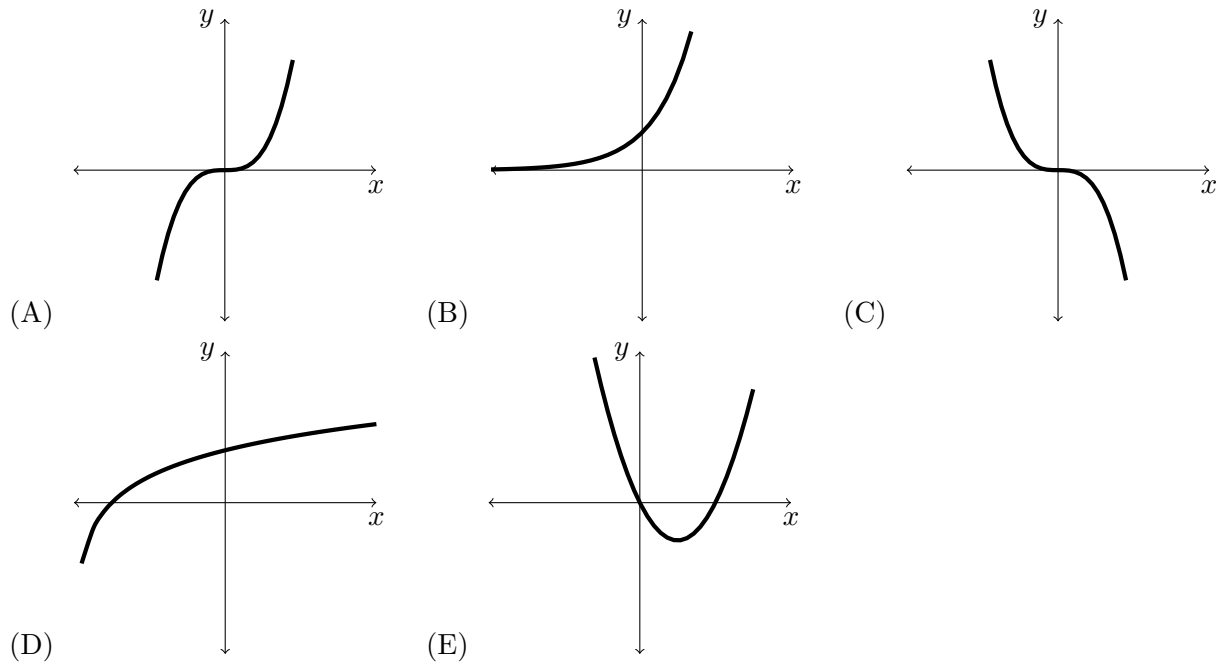
1. If $y = x^{\frac{3}{2}}$ then dy , the differential of y , as x changes from 64 to 64.1 is given by 1. _____

(A) 12 (B) 1.2 (C) 51.2 (D) 1.5 (E) 0.1

2. Find the critical numbers of $f(x) = \sqrt{4 - x^2}$. 2. _____

(A) $x = -4, 0, 4$ (B) $x = -4, 4$ (C) $x = -2, 2$
(D) $x = -2, 0, 2$ (E) There are no critical numbers

3. If, for all real numbers x , $f'(x) > 0$ and $f''(x) < 0$, which of the following curves could be a part of the graph of $f(x)$? 3. _____



4. If $f(x) = x \ln(x^2)$, then $\frac{dy}{dx} =$ 4. _____

(A) $\ln(x^2) + 2$ (B) $\frac{1}{x^2}$ (C) $\frac{2}{x}$ (D) $\ln(x^2) + \frac{1}{x}$ (E) $4 \ln(x)$

5. Identify all the vertical **and** horizontal asymptotes of the graph of 5._____

$$y = \frac{4x - 8}{x^2 + 5x - 14}.$$

- (A) Vertical asymptote at $x = -7$ and horizontal asymptote at $y = 0$
 (B) Vertical asymptote at $x = -7$ and horizontal asymptote at $y = 4$
 (C) Vertical asymptote at $x = 2$ and horizontal asymptote at $y = 4$
 (D) Vertical asymptotes at $x = -7, x = 2$ and horizontal asymptote at $y = 4$
 (E) Vertical asymptotes at $x = -7, x = 2$ and horizontal asymptote at $y = 0$

6. $\int \frac{6x^2 + 8x + 2}{x^3 + 2x^2 + x} dx =$ 6._____

- (A) $\frac{12x + 8}{3x^2 + 4x + 1} + C$ (B) $\ln|x^3 + 2x^2 + x| + C$ (C) $\frac{2x^3 + 4x^2 + 2x}{\frac{x^4}{4} + \frac{2x^3}{3} + \frac{x^2}{2}} + C$
 (D) $\frac{1}{2} \ln|x^3 + 2x^2 + x| + C$ (E) $2 \ln|x^3 + 2x^2 + x| + C$

7. A spherical balloon has its volume increasing at a rate of $7\text{cm}^3/\text{minute}$. 7._____
 When the radius of the balloon is 10 cm. , at what rate is its radius increasing?

(Recall that the volume of a sphere of radius r is given by $V = \frac{4}{3}\pi r^3$.)

- (A) $\frac{21}{400\pi}$ cm./minute (B) $\frac{7}{400\pi}$ cm./minute (C) $\frac{3}{700\pi}$ cm./minute
 (D) $\frac{3}{2800\pi}$ cm./minute (E) $\frac{21}{1000\pi}$ cm./minute

8. The average value of $f(x) = \frac{1}{\sqrt{x}}$ on the closed interval $[1, 4]$ is 8._____

- (A) $\frac{-1}{6}$ (B) $\frac{1}{6}$ (C) 6 (D) $\frac{8}{3}$ (E) $\frac{2}{3}$

9. For what value of k will $y = 3x^2 + kx - 5$ have a minimum at $x = -2$? 9._____

- (A) $k = 10$ (B) $k = 0$ (C) $k = 12$ (D) $k = \frac{7}{2}$ (E) Does not have a minimum value

10. An object moving on a line has velocity given by the equation $v(t) = 3t^2 + t$, for $t \geq 0$. At time $t = 2$, the object's position is $s(2) = 3$. Find the function describing the position, $s(t)$, at any time t . 10._____

- (A) $s(t) = t^3 + \frac{1}{2}t^2 - 7$ (B) $s(t) = 6t - 9$ (C) $s(t) = t^3 + \frac{1}{2}t^2$
 (D) $s(t) = 3t^2 + t - 11$ (E) $s(t) = 6t + 1$

11. The function $f(x) = x^3 - 6x^2 + 9x - 4$ has a relative **maximum** at 11._____

- (A) $x = 0$ (B) $x = 1$ (C) $x = 2$ (D) $x = 3$ (E) $x = 4$

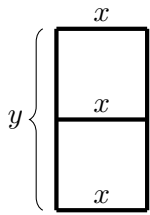
12. If $f(x) = e^{\frac{2}{x}}$, then $f'(x) =$ 12._____

- (A) $2e^{\frac{2}{x}} \ln(x)$ (B) $e^{\frac{2}{x}}$ (C) $e^{\frac{-2}{x^2}}$ (D) $-\frac{2}{x^2}e^{\frac{2}{x}}$ (E) $-2x^2e^{\frac{2}{x}}$

13. Find the equation of the tangent line to $y = 2x^3 + 1$ at the point $(2, 17)$. 13._____

- (A) $y = 24x - 17$ (B) $y = 17x - 19$ (C) $y = 17x - 17$ (D) $y = 24x - 31$ (E) $y = 17x + 13$

14. A window is to be made with a frame as shown. If the total length of the frame is to be 120 feet, which of the following should be solved to **maximize the area** of the window? 14._____



- (A) Maximize $3x + 2y$, subject to the constraint $xy = 120$
 (B) Maximize xy , subject to the constraint $3x + 2y = 120$
 (C) Maximize $x + y$, subject to the constraint $3x + 2y = 120$
 (D) Minimize xy , subject to the constraint $3x + 2y = 120$
 (E) Minimize $3x + 2y$, subject to the constraint $xy = 120$

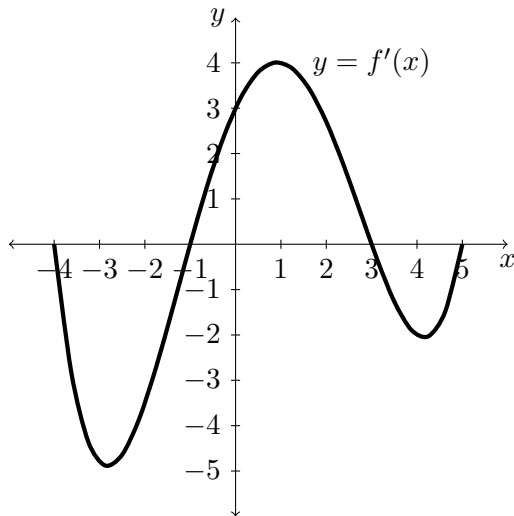
15. Find the absolute **maximum** value of $f(x) = x^3 - 3x^2$ on the interval $-1 \leq x \leq 1$. 15._____

(A) -4 (B) 4 (C) 0 (D) -2 (E) 2

16. Let $X = \begin{bmatrix} 4 & 2 \\ 1 & -1 \end{bmatrix}$. What is $X^2 + X$? 16._____

(A) $\begin{bmatrix} 26 & 4 \\ 2 & 8 \end{bmatrix}$ (B) $\begin{bmatrix} 18 & 2 \\ -4 & 6 \end{bmatrix}$ (C) $\begin{bmatrix} 22 & 8 \\ 4 & 2 \end{bmatrix}$ (D) $\begin{bmatrix} 20 & 6 \\ 2 & 0 \end{bmatrix}$ (E) $\begin{bmatrix} 12 & 0 \\ 14 & 4 \end{bmatrix}$

17. The graph of f' (the **derivative** of the function f) is shown below for $-4 \leq x \leq 5$. On which intervals is the graph of the **function**, f , *increasing*? 17._____



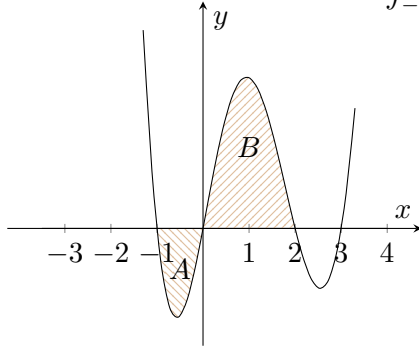
- (A) $-1 < x < 3$ only
 (B) $-3 < x < 1$ and $3 < x < 5$
 (C) $-3 < x < 1$ and $4 < x < 5$
 (D) $-4 < x < -3$ and $1 < x < 4$
 (E) $-3 < x < 1$ only

18. If $f(x) = 2x^2 + x$, simplify the expression $\frac{f(x + \Delta x) - f(x)}{\Delta x}$. 18._____

(A) $4x + 2\Delta x + 1$ (B) 1 (C) $4x\Delta x + 2(\Delta x)^2 + x$
 (D) $4x + 6\Delta x + 1$ (E) $4x\Delta x + 6(\Delta x)^2 + x$

19. The graph of $y = f(x)$ is shown below. Given that the area of region A is 1, the area of region B is 3 and $\int_{-1}^3 f(x)dx = \frac{3}{2}$, what is $\int_2^3 f(x)dx$?

19. _____



- (A) $-\frac{1}{2}$ (B) $-\frac{5}{2}$ (C) -1 (D) 1 (E) $-\frac{1}{4}$

20. Find all solutions to the system of equations

20. _____

$$\begin{aligned}x + y + 3z &= 2 \\2x + 3y + 2z &= 7.\end{aligned}$$

- (A) $x = -1, y = 3, z = -4$
 (B) $x = -1, y = 3, z = 0$
 (C) $x = -1 - 7z, y = 3 + 4z, z = z$
 (D) $x = -1 + 2z, y = 3 + 5z, z = z$
 (E) $x = -2 - z, y = -4 + 3z, z = z$

21. Find the derivative of $f(x) = (4x^2 + 1)^3$.

21. _____

- (A) $3(4x^2 + 1)^2$ (B) $3(8x)^2$ (C) $6x(4x^2 + 1)^2$
 (D) $(12x^2 + 3)(8x)^2$ (E) $24x(4x^2 + 1)^2$

22. Use implicit differentiation to find the slope of the tangent line to $3x^2 + 2xy - 4y^2 = 12$ at the point $(2, 1)$.

22. _____

- (A) $-\frac{5}{4}$ (B) $\frac{3}{2}$ (C) $\frac{2}{5}$ (D) $\frac{-7}{3}$ (E) $\frac{7}{2}$

23. The graph of $y = x^4 - 6x^3 + 12x^2 + 4x + 4$ is concave **downward** whenever 23._____

- (A) $-\infty < x < \infty$ (B) $1 < x < 2$ (C) $-\infty < x < 1$ or $2 < x < \infty$
(D) $x < 1$ only (E) $x > 2$ only

24. $\int_0^1 e^{2x} dx =$ 24._____

- (A) $\frac{e^2 - 1}{2}$ (B) $\frac{e^2}{2}$ (C) e^2 (D) $e^2 - 1$ (E) $\frac{e^3 - 1}{2}$

25. Given the function $f(x) = \begin{cases} x^2 + 1, & x < 2 \\ 8, & x = 2 \\ 3x - 1, & x > 2 \end{cases}$ state the intervals on which $f(x)$ is continuous. 25._____

- (A) Continuous only at $x = 2$
(B) Continuous for x in $(-\infty, 8)$ **and** $(8, \infty)$
(C) Continuous for x in $(-\infty, \infty)$
(D) Continuous for x in $(-\infty, 2)$
(E) Continuous for x in $(-\infty, 2)$ **and** $(2, \infty)$

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26. The position function of a particle is given by $s = t^3 - 1.5t^2 - 2t$, for $t \geq 0$. 26._____
- At what value of t does the particle reach a velocity of 166 *m/sec*?
- (A) $t = 7$ sec (B) $t = 8$ sec (C) $t = 5$ sec (D) $t = 3$ sec (E) $t = 12$ sec
27. The function $y = \frac{3x^2 + x - 2}{e^x}$ has a horizontal tangent line when: 27._____
- (A) $x = -3$ and $x = 1.125$ (B) $x = -0.468$ and $x = 2.135$ (C) $x = -1$ and $x = 0.667$
(D) $x = -0.415$ and $x = 2.278$ (E) Never
28. The total cost $C(x)$, in dollars, of producing x items is given by 28._____
- $C(x) = 0.01x^3 - 0.6x^2 + 13x$. What is the maximum profit if each item is sold for \$6? (Assume that everything produced is sold.)
- (A) \$63.03
(B) \$23.03
(C) \$58.56
(D) \$17.82
(E) There is no maximum profit.
29. Evaluate $\lim_{x \rightarrow 3} \frac{x^4 - 81}{x - 3}$. 29._____
- (A) 0 (B) 27 (C) 36 (D) 108 (E) Does not exist

30. Solve the following system of equations:

30._____

$$2x - 3y + 5z = 10$$

$$4x + y - z = 4$$

$$3x + 2y = 5$$

(A) $x = \frac{17}{13}, y = -\frac{15}{13}, z = \frac{20}{13}$

(B) $x = \frac{13}{8}, y = \frac{1}{8}, z = -\frac{3}{8}$

(C) $x = \frac{4}{17}, y = \frac{6}{17}, z = \frac{2}{17}$

(D) $x = \frac{25}{19}, y = \frac{10}{19}, z = \frac{34}{19}$

(E) $x = \frac{12}{23}, y = \frac{9}{23}, z = -\frac{10}{23}$

31. If $M = \begin{bmatrix} 1 & 4 & 3 \\ 2 & 5 & 1 \\ 3 & 7 & 1 \end{bmatrix}$, calculate M^{-1} .

31._____

(A) $\begin{bmatrix} 4 & 4 & 3 \\ 2 & 5 & 1 \\ 3 & 7 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} 0 & 4 & 3 \\ 2 & 5 & 1 \\ 3 & 7 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 2 & -17 & 11 \\ -1 & 8 & -5 \\ 1 & -5 & 3 \end{bmatrix}$

(D) $\begin{bmatrix} 3 & 4 & 3 \\ 2 & 5 & 1 \\ 3 & 7 & 1 \end{bmatrix}$ (E) $\begin{bmatrix} 1 & -9 & 3 \\ 2 & 5 & 1 \\ 3 & 7 & 1 \end{bmatrix}$

32. Find the x -coordinate of the inflection point of $y = x^5 + 3x^3 + 2x^2$.

32._____

(A) $x = 1.12630$ (B) $x = -2.00521$ (C) $x = 0.41639$ (D) $x = -0.21168$ (E) $x = 3.26923$

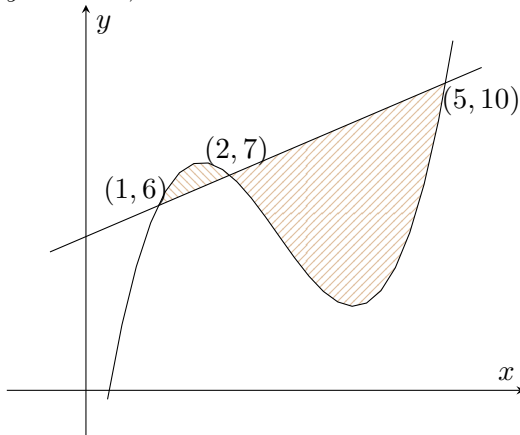
33. Given the demand curve $p = 35 - x^2$ and the supply curve $p = 3 + x^2$, find the producer surplus when the market is in equilibrium.

33._____

(A) 21.4 (B) 42.7 (C) 46.4 (D) 76.1 (E) 91.1

34. The cost function is given by $C(x) = 2x^2 - 3x + 5$, where x is the number of items produced. For what value of x is the AVERAGE cost function minimized? 34. _____
- (A) $x = 1.50$ (B) $x = 5.00$ (C) $x = 1.73$ (D) $x = 1.39$ (E) $x = 1.58$

35. What is the area enclosed by the graphs of $y = x^3 - 8x^2 + 18x - 5$ and $y = x + 5$, shown below? 35. _____



The curves intersect at (1, 6), (2, 7) and (5, 10).

- (A) 10.667 (B) 11.833 (C) 14.583 (D) 21.333 (E) 32

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