

BARUCH COLLEGE
MATH 2205 Practice Final 2, Part 1, NO CALCULATORS

1. Find the absolute *minimum* value of $f(x) = \frac{2x}{x^2 + 1}$ on the interval $0 \leq x \leq 2$. 1. _____
- (A) -1 (B) 0 (C) 1 (D) $\frac{4}{5}$ (E) 2
2. The functions $f(x)$ and $f^{-1}(x)$ are inverses of one another, where $f(-1) = 5$, $f'(5) = 7$ and $f'(-1) = 4$. Then $(f^{-1})'(5)$ is 2. _____
- (A) -4 (B) $\frac{1}{5}$ (C) $\frac{1}{7}$ (D) $\frac{1}{4}$ (E) -5
3. The cost of producing x items is $C(x) = 2x^3 - 20x^2 + 100x$. Find the value of x that minimizes the AVERAGE cost. 3. _____
- (A) 5 (B) 6 (C) 3 (D) 8 (E) 2
4. Solve for x : $\left(\frac{1}{3}\right)^{1-x} = 9$ 4. _____
- (A) -2 (B) 0 (C) -1 (D) 2 (E) 3
5. Solve for x : $\log_2(x) + \log_2(x - 7) = 3$ 5. _____
- (A) $x = 1$ and $x = 8$ (B) $x = -1$ only (C) $x = 8$ only
(D) $x = 3$ and $x = 4$ (E) $x = -1$ and $x = 8$
6. If $f(x) = xe^{x^2+1}$, then $f'(2)$ is 6. _____
- (A) $9e^5$ (B) $6e^5$ (C) $2e^5$
(D) $8e^5$ (E) e^4

7. $\int_0^4 \frac{1}{3x+1} dx =$ 7. _____

- (A) $\frac{1}{13}$ (B) $\frac{1}{13} \ln 4$ (C) $\frac{1}{3} \ln 13$ (D) $\frac{1}{4}$ (E) $\frac{3}{3x+1}$

8. Find $\frac{dy}{dx}$ for $y = \ln\left(\frac{\sqrt{x-5}}{4x^3+1}\right)$. 8. _____

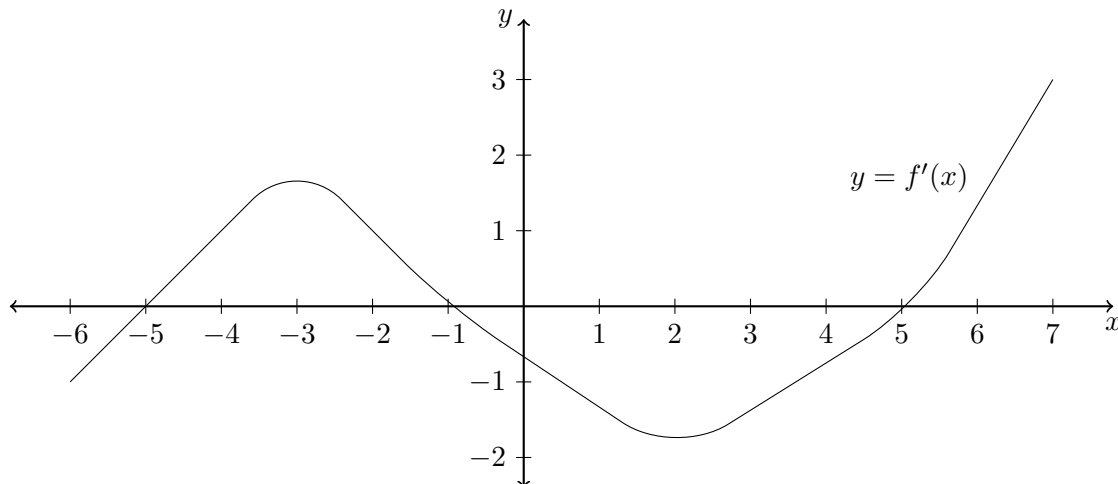
Hint: Use the properties of the logarithm function before differentiating.

- (A) $\frac{\sqrt{x-5}}{4x^3+1}$ (B) $\frac{1}{2(x-5)} - \frac{12x^2}{4x^3+1}$ (C) $\frac{4x^3+1}{\sqrt{x-5}}$
 (D) $e^{\sqrt{x-5}} - e^{4x^3+1}$ (E) $\frac{1}{2\sqrt{x-5}} - \frac{12x^2}{4x^3+1}$

9. If the second derivative of $f(x)$ is $f''(x) = (3-x)(x^2-4)$, on what interval(s) is $f(x)$ concave **up**? 9. _____

- (A) $(-\infty, -2)$ and $(2, 3)$ (B) $(-2, 2)$ (C) $(-\infty, \infty)$
 (D) $(2, \infty)$ (E) $(-2, 2)$ and $(3, \infty)$

10. The graph of $f'(x)$, the *derivative* of f , is given below for $-6 \leq x \leq 7$. On what intervals is the function, $f(x)$, increasing? 10. _____

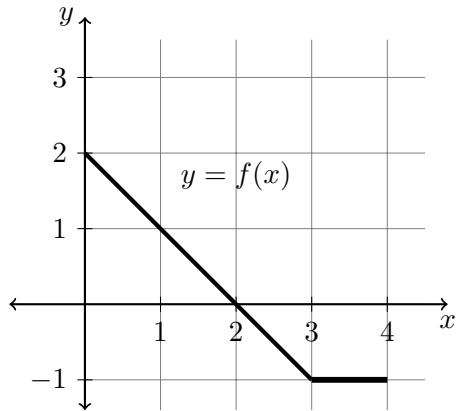


Note: this is the graph of the derivative of $f(x)$, not the graph of $f(x)$ itself.

- (A) $(-3, 2)$ (B) $(-3, 7)$ (C) $(-5, -1)$ and $(5, 7)$
 (D) $(-6, -3)$ and $(2, 7)$ (E) $(-6, -5)$ and $(-1, 5)$

11. The graph of $y = f(x)$ is given below. Evaluate $\int_0^4 f(x) dx$.

11. _____



- (A) 0.5 (B) 1.5 (C) -0.5
 (D) 3.5 (E) -2.5

12. An object moving on a line has velocity given by $v(t) = 3t^2 - 4t + 6$, $t \geq 0$. At time $t = 1$ the object's position is $s(1) = 2$. Find $s(t)$, the object's position at any time t .

12. _____

- (A) $s(t) = t^3 - 2t^2 + 6t + 2$ (B) $s(t) = 6t - 4$ (C) $s(t) = t^3 - 2t^2 + 6t - 3$
 (D) $s(t) = t^4 - 2t^3 + 6t^2 - 3$ (E) $s(t) = 5$

13. Linearize $f(x) = x^4$ at $x = 2$, and then use the linearization to approximate $f(2.01)$.

13. _____

- (A) 16.01 (B) 16.24 (C) 18.24
 (D) 16.32 (E) 16.04

14. If $f(x) = \frac{4x - 1}{2x + 3}$, then the inverse function $f^{-1}(x)$ is:

14. _____

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

15. The function $f(x) = 4x^3 + 9x^2 + 6x - 5$ has a point of inflection at 15._____

(A) $x = 1$ (B) $x = -\frac{1}{2}$ (C) $x = \frac{1}{4}$

(D) $x = -\frac{3}{4}$ (E) $x = -\frac{1}{2}$ and $x = -1$

16. Evaluate $\int_1^4 \left(3\sqrt{x} + \frac{4}{x^2} \right) dx$ 16._____

(A) 6 (B) 7 (C) 18
(D) 10 (E) 17

17. Evaluate $\sum_{i=1}^4 i(4-i)$ 17._____

(A) 0 (B) -10 (C) 10
(D) 9 (E) -9

18. $\int (x^3 + 2x)^5 (12x^2 + 8) dx =$ 18._____

(A) $\frac{1}{6}(x^3 + 2x)^6 + C$ (B) $\frac{1}{6}(x^3 + 2x)^6 \frac{1}{2}(12x^2 + 8)^2 + C$ (C) $\frac{1}{2}(12x^2 + 8)^2 + C$

(D) $\frac{2}{3}(x^3 + 2x)^6 + C$ (E) $(x^3 + 2x)^6 + C$

19. Solve the differential equation $\frac{dy}{dx} = \frac{x^2}{y^2}$, $y \neq 0$, with the initial condition $y(0) = 2$. 19._____

(A) $y = \sqrt{x^2 + 8}$ (B) $y = x + 8$ (C) $y = \sqrt{x^3 + 1}$
(D) $y = \sqrt[3]{x^3 + 1}$ (E) $y = \sqrt[3]{x^3 + 8}$

20. The demand for a commodity x is given by $x + 3p^2 = 1000$, where p is the price. Find the elasticity of demand if $p = 10$. 20._____
- (A) $-\frac{4}{9}$ (B) $-\frac{1}{6}$ (C) -2 (D) $-\frac{6}{7}$ (E) $-\frac{5}{8}$
21. The *difference* of one number x and twice a second number y is 16. What is the minimum possible PRODUCT of x and y ? 21._____
- (A) -32 (B) -24 (C) 80
(D) 12 (E) -48
22. The function $f(x) = 2x^3 + 3x^2 - 36x$ has a relative *maximum* at 22._____
- (A) $x = -3$ (B) $x = -2$ (C) $x = 0$ (D) $x = 2$ (E) $x = 3$
23. The approximate area bounded by $y = 5 - x^2$, the x axis, $x = -1$ and $x = 2$, using three rectangles of equal width and **right** hand endpoints is: 23._____
- (A) 9 (B) 10 (C) 11
(D) 12 (E) 13
24. If $f(2) = 7$, $f'(2) = 0$ and $f''(2) = -5$, then the point $(2, 7)$ is 24._____
- (A) a relative maximum (B) a relative minimum (C) a point of inflection
(D) a point of discontinuity (E) none of the above
25. Find the average value of $f(x) = 4x - x^2$ on the interval $0 \leq x \leq 2$. 25._____
- (A) $\frac{16}{3}$ (B) 2 (C) 4
(D) 8 (E) $\frac{8}{3}$

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26. Given the demand equation $p = 4200 - 1.5x^2$ and the supply equation $p = x^2 + 200$, find the *producer* surplus when the market is in equilibrium. Round your answer to the nearest whole number. 26._____

(A) 64000 (B) 128000 (C) 42667
(D) 85333 (E) 106667

27. If the interest rate is 7% compounded *monthly*, how much will \$8,000 accumulate to after 6 years? 27._____

(A) \$12,175.79 (B) \$12,160.84 (C) \$11,360.00
(D) \$11,428.83 (E) \$10,690.20

28. The table below shows the number of cellular phone subscriptions in the U.S. in millions for the years from 2003 to 2009. Using the year 2003 as the reference year (year zero), find the exponential function that best fits the data, and from that function estimate the number of subscriptions in 2012. 28._____

Year	Millions of subscriptions
2003	16.00
2005	33.80
2006	44.10
2007	55.30
2009	86.05

(A) 220.25 million (B) 215.13 million (C) 212.45 million
(D) 171.17 million (E) 116.55 million

29. If $s(t) = e^t - t \ln t - 3t$ represents the position of a particle at time t , find $a(t)$, the acceleration of the particle at time $t = 3$. 29._____

(A) 13.8883 (B) 19.7522 (C) 14.9869
(D) 17.3321 (E) 18.9831

30. Given the marginal cost function $C'(x) = 99x^2 - 24x$, find the cost of producing 6 items if the fixed cost is \$1500. 30._____

(A) \$ 6696 (B) \$ 3420 (C) \$ 8196
(D) \$ 4920 (E) \$ 5196

31. Find the area bounded by $y = x^3 - 4x^2 + 1$ and $y = x - 3$. 31._____

- (A) $\frac{253}{12} \approx 21.08$ (B) $-\frac{125}{12} \approx -10.42$ (C) $\frac{211}{12} \approx 17.58$
(D) $\frac{125}{12} \approx 10.42$ (E) $\frac{157}{12} \approx 13.08$

32. If a company sells an item for $p = 75 - .01x$ dollars each, and the cost of manufacturing x items is $C(x) = 1850 + 28x - x^2 + .001x^3$, find the production level which maximizes the profit. Round your answer to the nearest whole number. 32._____

- (A) 710 (B) 652 (C) 844
(D) 657 (E) 683

33. If \$5000 is invested at the interest rate of 4.5% compounded continuously, how long will it take for the amount to grow to \$25,000? 33._____

- (A) 33.27 years (B) 37.57 years (C) 34.77 years
(D) 36.87 years (E) 35.77 years

34. For which x -values does the graph of $y = e^{3x^3 - 2x^2 - 4x}$ have a horizontal tangent line? 34._____

- (A) $x = 1.215$ and $x = -0.549$
(B) $x = 1.535$
(C) $x = -0.481$ and $x = 0.925$
(D) $x = -0.869$, $x = 0$ and $x = 1.535$
(E) $x = -0.758$ and $x = -0.208$

35. The half-life of a radioactive substance is 2 years. How many years does it take for 4 grams of the substance to decay to 0.6 grams? Round off your answer to two places after the decimal. 35._____

- (A) 5.47 years (B) 0.347 years (C) 2.21 years
(D) 3.08 years (E) 4.27 years

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