MA 220 **Final Exam Practice Problems**

1. If $f(x) = -x^2 - 3x + 4$, calculate $f(-2)$.
   A. -6 B. 0 C. 2 D. 6 E. 14

2. If $f(x) = 2x^2 - x + 1$, find and simplify $f(x+2)$.
   A. $2x^2 - x + 3$ B. $2x^2 + 7x + 7$ C. $2x^2 - x + 7$ D. $2x^2 + 7x + 11$ E. $2x^2 - x + 11$

3. Simplify: $(3x-7)(2x+4) - 4(x-3)$.
   A. $6x^2 - 11x - 16$ B. $6x^2 - 6x - 40$ C. $6x^2 - 4x - 16$ D. $6x^2 - 11x - 40$ E. $6x^2 - 6x - 16$

4. Simplify: $\dfrac{9x^2-4}{3x^2+x-2} \cdot \dfrac{2x+2}{12x^2+11x+2}$
   A. $\dfrac{2x+2}{(4x+1)(x+1)}$ B. $\dfrac{2}{4x+1}$ C. $\dfrac{3x+2}{(3x+1)(2x+1)}$ D. $\dfrac{1}{2x+1}$ E. $\dfrac{2(3x-2)}{(4x+1)(3x+2)}$

5. At 6 a.m. a snowplow, traveling at a constant speed, begins to clear a street. At 8 a.m. a car begins traveling that street from the snowplow's starting point, at a speed of 30 mi/hr. Half an hour later, the car reaches the snowplow. Find the speed of the snowplow.
   A. 6 mi/hr B. 7.5 mi/hr C. 7.6 mi/hr D. 12.2 mi/hr E. 30 mi/hr

6. A box with a square base and no top is to be made from a square piece of tin by cutting out a 3-inch square from each corner and folding up the sides. If the box must hold 48 in^3, which equation can be used to find the length of the side of the piece of tin?
   A. $3(x-3)(x-3) = 48$ B. $x(x-3)(x-3) = 48$ C. $3(x-6)(x-6) = 48$ D. $x(x-6)(x-3) = 48$
   E. $3(x-6)(x-3) = 48$

7. Find the slope of the line containing the points $(-2, 4)$ and $(6, -3)$.
   A. 4 B. $-\frac{7}{8}$ C. $\frac{1}{4}$ D. $-\frac{8}{7}$ E. $-\frac{1}{2}$

8. Suppose 280 tons of corn were harvested in 5 days and 940 tons in 20 days. If the relationship between tons T and days d is linear, express T as a function of d.
   A. $T(d) = 5d + 280$ B. $T(d) = -44d + 500$ C. $T(d) = 60d + 280$ D. $T(d) = 60d + 44$
   E. $T(d) = 44d + 60$

9. If $f(x) = \sqrt{x+1}$ and $g(x) = x^2 + 7$ then $(f \circ g)(-1) =$
   A. 3 B. $\sqrt{7}$ C. 0 D. 7 E. $\sqrt{3}$

10. $\lim\limits_{x \to 1} \dfrac{x^2 + 4x - 5}{x^2 - 1} =$
    A. -3 B. 0 C. 3 D. 5 E. Limit does not exist.

11. $\lim\limits_{x \to \infty} \dfrac{x^3 - x^2}{2x^2 - 3x + 1} =$
    A. -1 B. 0 C. $\frac{1}{2}$ D. 1 E. Limit does not exist.

12. $\lim\limits_{\Delta x \to 0} \dfrac{(x+\Delta x)^2 - 3(x+\Delta x) - (x^2 - 3x)}{\Delta x} =$
    A. $-4x + 3$ B. 3 C. $-4x$ D. $2x - 3$ E. -3

13. Find y' if $y = 9x^2 + \dfrac{1}{4x^3} - \sqrt{x} + 1$.
    A. $18x - \dfrac{3}{4x^4} + \dfrac{1}{2x^{3/2}}$ B. $18x - \dfrac{12}{x^4} - \dfrac{1}{2x^{1/2}}$ C. $18x - \dfrac{3}{4x^4} - \dfrac{1}{2x^{1/2}}$ D. $18x - \dfrac{12}{x^4} + \dfrac{1}{2x^{3/2}}$
    E. $18x - \dfrac{3}{4x^2} - \dfrac{1}{2x^{1/2}}$

14. The derivative of $(7x+4)(x^2-3x)$ is:
A. $21x^2-13x$ B. $21x^2-34x-12$ C. $14x-21$ D. $7x^3-17x^2-12x$ E. $7x^2+8x-12$

15. The derivative of $\dfrac{x^2+1}{x+5}$ is:
A. $\dfrac{x^2+10x-1}{(x+5)^2}$ B. $2x$ C. $\dfrac{2x^2+10x}{(x^2+1)^2}$ D. $\dfrac{3x^2+10x+1}{(x+5)^2}$ E. $\dfrac{-x^2-10x+1}{(x+5)^2}$

16. If $y=(3-x^2)^3$ then $y''=$
A. $-6x(3-x^2)^2$ B. $24x^2(3-x^2)-6(3-x^2)^2$ C. $6(3-x^2)$ D. $24x^2(3-x^2)$ E. $12x^2-6(3-x^2)$

17. The line tangent to the graph of $f(x)=x-\dfrac{1}{x}$ at $x=2$ has slope:
A. $\frac{1}{4}$ B. $\frac{3}{4}$ C. $\frac{3}{2}$ D. 0 E. $\frac{5}{4}$

18. A cost function is given by $C(x)=1000\sqrt{x^2+2}$. Use the marginal cost function to estimate the cost of the 11^{th} unit. Round your answer to the nearest cent.
A. \$499.15 B. \$99.01 C. \$10,099.50 D. \$49.51 E. \$990.15

19. Suppose the distance (in feet) covered by a car moving along a straight road t seconds after starting from rest is given by the function $f(t)=2t^2$ $(0\le t\le 30)$. Find the average velocity of the car over the time interval $[22, 22.1]$.
A. 88.2 ft/sec B. 88.4 ft/sec C. 88.6 ft/sec D. 95.2 ft/sec E. 97.7 ft/sec

20. Find all values of x for which the function $f(x)=2x^3-3x^2-12x+12$ is increasing.
A. $(-1,2)$ B. $(-\infty,-1)$ C. $(2,\infty)$ D. $(-\infty,-1)\cup(2,\infty)$ E. $(-1,2)\cup(2,\infty)$

21. For what value of a does the function $f(x)=x^2+ax$ have a relative minimum at $x=1$?
A. -2 B. 0 C. 2 D. -1 E. 1

22. If the concentration $C(t)$ of a certain drug remaining in the bloodstream t minutes after it is injected is given by $C(t)=t/(5t^2+125)$, then the concentration is a maximum when $t=$
A. 25 B. 15 C. 5 D. 10 E. There is no maximum.

23. If $f(x)=2x^4-6x^2$ then which one of the following is true?
A. f has a relative max. at $x=\pm\sqrt{3/2}$ and a relative min at $x=0$.
B. f has a relative max. at $x=0$ and a relative min. at $x=\pm\sqrt{3/2}$.
C. f has a relative max. at $x=-\sqrt{3/2}$ and a relative min. at $x=\sqrt{3/2}$.
D. f has a relative max. at $x=\sqrt{3/2}$ and a relative min. at $x=-\sqrt{3/2}$.
E. f has no relative max. points, but has relative min. at $x=\pm\sqrt{3/2}$.

24. The derivative of a function f is $f'(x)=x^2-\dfrac{8}{x}$. Then at $x=2$, f has:
A. an inflection point B. a relative maximum C. a vertical tangent D. a vertical asymptote E. a relative minimum

25. If $f(x)=\frac{1}{3}x^3-9x+2$. Then on the closed interval $0\le x\le 4$,
A. f has an absolute max. at $x=3$ and an absolute min. at $x=0$.
B. f has an absolute max. at $x=4$ and an absolute min. at $x=3$.
C. f has an absolute max. at $x=0$ and an absolute min. at $x=4$.
D. f has an absolute max. at $x=0$ and an absolute min. at $x=3$.
E. f has an absolute max. at $x=4$ and an absolute min. at $x=0$.

26. A cost function is given by $C(x) = 1000\sqrt{x^3+1}$. Find the marginal cost when $x = 2$.

    A. \$166.67 B. \$333.33 C. \$4000 D. \$2000 E. \$1000

27. A display case is in the shape of a rectangular box with a square base and open top. Suppose the volume is 21 cubic ft If x is the length of one side of the base, what value should x have to minimize the surface area? Round your answer to two decimal places.

    A. 2.78 ft B. 3.48 ft C. 4.58 ft D. 6.48 ft E. 9.17 ft

28. A manufacturer determines that in order to sell x units of a product, the price per unit must be $p = 1000 - x$. The manufacturer also determines that the total cost of producing x units is $C(x) = 3000 + 20x$. Calculate the maximum profit.

    A. \$490 B. \$121,500 C. \$237,100 D. \$23,000 E. There is no maximum.

29. Find all asymptotes of the function: $\dfrac{x - x^2}{3x^2 - x - 4}$

    A. vert: $x = -1, x = \frac{4}{3}$, horiz: $y = -\frac{1}{3}$ B. vert: $x = 0, x = 1$, horiz: $y = -1, y = \frac{4}{3}$
    C. vert: $x = -1, x = \frac{4}{3}$, horiz: $y = 0$ D. vert: $x = 0, x = 1$, horiz: $y = 0$
    E. vert: $x = 0, x = 1$, horiz: $y = -\frac{1}{3}$

30. If $y = e^{x^2}$ then $\dfrac{dy}{dx} =$

    A. e^{x^2} B. $x^2 e^{x^2-1}$ C. $2xe^{x^2-1}$ D. $2xe^{x^2}$ E. e^{2x}

31. If $y = \ln(1 - x^2)$ then $\dfrac{dy}{dx} =$

    A. $\dfrac{1}{1-x^2}$ B. $\dfrac{2x}{\sqrt{1-x^2}}$ C. $\dfrac{-2x}{1-x^2}$ D. $\dfrac{1}{2(1-x^2)}$ E. $\dfrac{2x}{1-x^2}$

32. A population grows exponentially. In 1960 it was 50,000 and in 1965 it was 100,000. What was the population in 1970?

    A. 200,000 B. 150,000 C. 250,000 D. 300,000 E. 225,000

33. Find f' if $f(x) = x^2 e^{3x}$.

    A. $xe^{3x}(x+2)$ B. $3x^3 e^{3x-1}$ C. $6xe^{3x}$ D. $5x^3 e^{3x}$ E. $xe^{3x}(3x+2)$

34. If $y = \ln\sqrt{1-x^2}$ then $\dfrac{dy}{dx} =$

    A. $\dfrac{1}{\sqrt{1-x^2}}$ B. $-\dfrac{2x}{\sqrt{1-x^2}}$ C. $-\dfrac{x}{1-x^2}$ D. $\dfrac{1}{2(1-x^2)}$ E. $\dfrac{1}{2\sqrt{1-x^2}}$

35. What lump sum of money should be deposited in a money market certificate paying 8.25% interest compounded monthly to amount to 5000 in 10 years? Round your answer to the nearest dollar.

    A. \$2514 B. \$4669 C. \$2740 D. \$2262 E. \$2197

36. How quickly will money double if it is invested at a rate of 8 percent compounded continuously? Round your answer to two decimal places.

    A. 0.87 years B. 25 years C. 5.55 years D. 8.66 years E. 6.33 years

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Answers

1. D; 2. B; 3. E; 4. B; 5. A; 6. C; 7. B; 8. E; 9. A; 10. C; 11. E; 12. D; 13. C; 14. B; 15. A; 16. B; 17. E; 18. E; 19. A; 20. D; 21. A; 22. C; 23. B; 24. E; 25. D; 26. D; 27. B; 28. C; 29. A; 30. D; 31. C; 32. A; 33. E; 34. C; 35. E; 36. D