

Math 2413 Exam Review

Name _____

Date _____

- Which of the following statements is true of $f(x) = -x^3 + 9x^2 - 24x + 18$?
 - f is decreasing on $(2, 4)$
 - f is increasing on $(3, \infty)$
 - f is increasing on $(2, 4)$
 - f is increasing on $(-\infty, 2)$
 - f is decreasing for all real values
- Over which interval(s) is $f(x) = \frac{x^2}{x^2 + 9}$ is decreasing?
 - $(0, \infty)$
 - $(-3, 3)$
 - $(-\infty, 0)$
 - $(-\infty, \infty)$
 - $(-\infty, 0)$ and $(3, \infty)$
- Find the point of inflection of $f(x) = x^3 - 3x^2 - x + 7$.
 - $(1, 4)$
 - $(2, 1)$
 - $(0, 7)$
 - $(3, 4)$
 - $(-1, 4)$
- Given a function defined by $f(x) = 3x^5 - 5x^3 + 12$, for what value(s) of x is there a point of inflection?
 - $\frac{\sqrt{2}}{2}$ only
 - $-\frac{\sqrt{2}}{2}$ only
 - $-\frac{\sqrt{2}}{2}$ and $\frac{\sqrt{2}}{2}$
 - $0, -\frac{\sqrt{2}}{2}$ and $\frac{\sqrt{2}}{2}$
 - 0 and $\frac{\sqrt{2}}{2}$
- Given $f(x) = \frac{x}{x^2 + 1}$, find the x -value(s) of the points of inflection on the graph of $f(x)$.
 - 1 only
 - 0 only
 - $\sqrt{3}$ and $-\sqrt{3}$
 - $\sqrt{3}, -\sqrt{3}, 0$
 - 0 and $\sqrt{3}$
- Find all intervals on which the function $y = 8x^3 - 2x^4$ is concave downward.
 - $(-\infty, 0)$ and $(2, \infty)$
 - $(-\infty, 24)$ and $(48, \infty)$
 - $(-\infty, 2)$ and $(8, \infty)$
 - $(0, 2)$
 - $(24, 48)$
- The graph of $f(x) = \frac{-7}{x - 4}$ is concave downward for all values of x such that
 - $x < 4$
 - $x > 4$
 - $x < 0$
 - $x > 0$
 - $x > -7$
- If $y = e^{x^3+5x}$, then $y' =$
 - $(3x^2 + 5)e^{x^3+5x}$
 - e^{x^3+5x}
 - $3x^2 + 5$
 - $(x^3 + 5x)e^{x^3+5x}$
 - $(3x^2 + 5)e^{3x^2+5}$
- Given $f(x) = e^{\ln(x^3-5)}$, find $f'(x)$.
 - $x^3 - 5$
 - $3x^2$
 - $\frac{e}{3xe^2}$
 - $\frac{e}{e^{x^3-5}}$
 - $\frac{3}{xe^3 - 5}$
- If $y = \ln(x^2 + 3x)$, then $\frac{dy}{dx} =$
 - $\frac{2x + 3}{x(x + 3)}$
 - $\frac{2x}{x(x + 3)}$
 - $\frac{2}{x}$
 - $\frac{2}{x(x + 3)}$
 - $\frac{x(x + 3)}{2x + 3}$

11. If $y = 3^{2x^2-5x}$, then $\frac{dy}{dx} =$
- a) $4x - 5(3^{2x^2-5x})$ b) $(2x^2 - 5x)(3^{2x^2-5x-1})$ c) $4x(3^{2x^2-5x}) \ln 3$
d) $(4x - 5)e^3(3^{2x^2-5x})$ e) $(4x - 5)(3^{2x^2-5x}) \ln 3$
12. Let $f(x) = x^3 - x^2 + 3$. Determine the critical numbers.
- a) $0, \frac{2}{3}$ b) $1, 3$ c) $0, 3$ d) $\frac{2}{3}, 3$ e) $1, \frac{2}{3}$
13. Given that $f(x) = -x^2 + 12x - 28$ has a relative maximum at $x = 6$, choose the correct statement.
- a) f' is negative on the interval $(-\infty, 6)$ b) f' is positive on the interval $(-\infty, \infty)$
c) f' is negative on the interval $(6, \infty)$ d) f' is positive on the interval $(6, \infty)$
e) f' is negative for all real values
14. Find the maximum value of $f(x) = x^2 - 4x + 4$ on the interval $[-2, 2]$.
- a) 16 b) 9 c) 4 d) 1 e) 0
15. Find the minimum value of $f(x) = -x^3 + x^2$ on $-3 \leq x \leq 3$.
- a) -18 b) -27 c) -36 d) 0 e) -36
16. Find an equation of the tangent line to the curve $f(x) = x^2 - 10$ passing through the point $(5, 1)$.
- a) $y - 1 = -10(x - 5)$ b) $y + 5 = -10(x + 1)$ c) $y + 1 = 10(x + 5)$
d) $y - 1 = 10(x - 5)$ e) $y - 5 = 10(x - 1)$
17. Given $y = \arcsin(7x)$, then $\frac{dy}{dx} =$
- a) $\frac{7}{\sqrt{1-7x^2}}$ b) $\frac{7}{\sqrt{1-49x^2}}$ c) $\frac{7}{\sqrt{1-\sin(7x)}}$ d) $\frac{-7}{\sqrt{1-49x^2}}$ e) $\frac{7}{\sqrt{1-x^2}}$
18. Differentiate: $f(x) = \tan^{-1}\left(\frac{x}{7}\right)$
- a) $\frac{7}{x^2+49}$ b) $\frac{7}{x^2-49}$ c) $-\frac{7}{x^2-49}$ d) $-\frac{7}{x^2+49}$ e) $\frac{1}{7}$
19. If $x = y + 3y^2 + 5y^3$, then $\frac{dy}{dx} =$
- a) $\frac{3}{1+6y+15y^2}$ b) $\frac{1}{6y+15y^2}$ c) $\frac{x}{1+6y+15y^2}$
d) $\frac{1}{1+6y+15y^2}$ e) $(1+6y+15y^2)^{-2}$
20. Find $\frac{dy}{dx}$ for $5x^2 - 2xy + 7y^2 = 0$.
- a) $\frac{10x+14y}{2x}$ b) $-\frac{10x-2y}{14y}$ c) $10x-2y+14y$ d) $-\frac{10x-2y}{-2x+14y}$ e) $\frac{5x+7y}{x-2y}$

21. The product of two positive numbers is 576. The sum of the first and four times the second is minimized. Find the two numbers.
- a) 24 and 24 b) 36 and 16 c) 48 and 12 d) 96 and 6
e) Both numbers are $12\sqrt{3}$
22. An open box can be made from a square piece of material, by cutting equal squares from each corner and turning up the sides. Find the dimensions of the box of maximum volume if the material has dimension 20 cm by 20 cm.
- a) $\frac{10}{3}$ cm $\times$ $\frac{40}{3}$ cm $\times$ $\frac{40}{3}$ cm b) 7.5 cm $\times$ 7.5 cm $\times$ 5 cm c) 4.5 cm $\times$ 4.5 cm $\times$ 11 cm
d) 3.5 cm $\times$ 3.5 cm $\times$ 13 cm e) 6 cm $\times$ 6 cm $\times$ 8 cm
23. How fast is the area of a square increasing when the side is 5 m in length and growing at a rate of 0.6 m/min?
- a) 7.2 m²/min b) 15.0 m²/min c) 1.2 m²/min d) 3.0 m²/min e) 6.0 m²/min
24. The radius of a circle is increasing at the rate of 3 inches per minute. At what rate is the area increasing when the radius is 8 inches?
- a) 48 π in²/min b) 96 π in²/min c) 16 π in²/min d) 24 in²/min e) 48 in²/min
25. A stone dropped in a still pond creates a circular ripple whose radius increases at a constant rate of 2 ft/s. At what rate is the area enclosed by the ripple increasing 10 s after the stone strikes the pond?
- a) 60 π ft²/s b) 200 π ft²/s c) 120 π ft²/s d) 40 π ft²/s e) 80 π ft²/s

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Answer List

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|-------|-------|-------|
| 1. c | 2. c | 3. a |
| 4. d | 5. d | 6. a |
| 7. b | 8. a | 9. b |
| 10. a | 11. e | 12. a |
| 13. c | 14. a | 15. a |
| 16. d | 17. b | 18. a |
| 19. d | 20. d | 21. c |
| 22. a | 23. e | 24. a |
| 25. e | | |