East Los Angeles College
Department of Mathematics
Math 261
Test 3 Study Guide

Your exam will not consist of this many question and will be much shorter. However, it will serve as a good study guide for your exam.

Determine the critical value for the following functions.

1. $f(x) = 2x^3 + x^2 + 2x$

2. $f(x) = |x - 5|$

3. $f(x) = \frac{x-1}{x^2+1}$

4. $f(x) = x^{1/3} - x^{-2/3}$

5. $f(x) = 4x - \tan(x)$ over $0 \leq x \leq 2\pi$

Determine the absolute max and absolute min for the following functions over the given interval.

6. $f(x) = 2x^3 - 3x^2 - 12x + 1 \ \ over \ [-2,3]$

7. $f(x) = (x^2 - 1)^3 \ \ over \ [-1,2]$

8. $f(\theta) = 2cos(\theta) + sin(2\theta) \ \ over \ [0, \frac{\pi}{2}]$

9. $f(x) = \frac{x}{x^2-x+1} \ \ over \ [0,3]$

Verify the function satisfies the hypothesis of the Mean Value Theorem on the given interval and find the value of c such that the conclusion satisfies the mean value theorem.

10. $f(x) = 2x^2 - 3x + 1 \ \ over \ [0,2]$

11. $f(x) = \frac{1}{x} \ \ over \ [1,3]$

Determine the intervals of increasing/decreasing, local max and local min, intervals of concavity, inflection points (if any).

12. $f(x) = x^4 - 2x^2 + 3$

13. $f(x) = \frac{x}{x^2+1}$

14. $f(\theta) = \sin(\theta) + \cos(\theta) \ \ over \ 0 \leq \theta \leq 2\pi$

15. $f(\theta) = cos^2(\theta) - 2sin(\theta) \ \ over \ 0 \leq \theta \leq 2\pi$

16. $f(x) = x\sqrt{6 - x}$

Determine the following limits at infinity

17. $\lim_{x\to\infty} \frac{1-x^2}{x^3-x+1}$

18. $\lim_{x\to\infty} \frac{3x-2}{2x+1}$

19. $\lim_{x\to\infty} \frac{\sqrt{x}+x^2}{2x-x^2}$

20. $\lim_{x\to-\infty} \left(x+\sqrt{x^2+2x}\right)$

21. $\lim_{x\to-\infty} \frac{1+x^6}{x^4+1}$

22. $\lim_{x\to\infty} (x^2-x^5)$

23. $\lim_{x\to\infty} \sqrt{x}sin\left(\frac{1}{x}\right)$

Using the area of a circle formula $A=\pi r^2$

24. Determine the average rate of change over the interval $1 \le r \le 3$
25. Determine the related rates equation for the area of the circle.
26. If the area of a circle is increasing at a rate of 6 cm/sec. At what rate is the radius increasing when the radius of the circle is 2 cm?

Using the volume of a sphere formula $V=\frac{4}{3}\pi r^3$.

27. Find the average rate of change of V with respect to the radius when it goes from 5 inch to 8 inches.
28. What is the related rates equation for the volume of a sphere.
29. If the radius of sphere is decreasing at a rate of 5 inches per sec, what is the rate of change for the volume of a sphere when the radius is 12 inches?

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30. Two cars start moving from the same point. One travels South at 60 miles per hour and the other travels West at 25 miles per hour. At what rate is the distance between the cars increasing 2 hours later?

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31. A particle moves along a curve the curve at $y=2\sin\left(\frac{\pi x}{2}\right)$. As the particle passes through the point $\left(\frac{1}{3},1\right)$ its x-coordinate is increasing at a rate of $\sqrt{10}$ cm/sec. How fast is the distance from the particle to the origin changing at this instant?

Determine the linearization function at the indicated points for the following functions.

32. $f(x) = \sqrt[3]{x} \ \ at\ a = -1$
33. $f(x) = \sin(x) \ \ at\ a = \frac{\pi}{6}$

Use the linearization functions above to approximate the following expressions.

34. $\sqrt[3]{-0.96}$ see 32
35. $\sin\,(0.48)$ see 33

Use the curve sketching guide lines to sketch the following curves.

36. $f(x) = \frac{2x^2}{x^2-1}$

37. $f(x) = 2 + 3x^2 - x^3$

38. $f(x) = x - 3x^{1/3}$

39. $f(x) = x + \cos\,(x)$

40. $f(x) = (4 - x^2)^5$