

REVIEW FOR SEMESTER EXAM

Be sure you can find limits.

1. $\lim_{x \rightarrow 2} \frac{(x^3 - 8)}{(x - 2)}$

2. $\lim_{x \rightarrow 5} \frac{(x - 4)}{(x - 2)}$

3. $\lim_{x \rightarrow 2} 5$

4. $\lim_{x \rightarrow \infty} \frac{(5x^2 - 2x^3 + 1)}{(4x^3 - 3x)}$

5. $\lim_{x \rightarrow 0} \frac{\sin x}{x}$

Be sure you can find derivatives. Find the derivative of each of the following:

6. $y = \sin(x^2)$

7. $y = 5\pi^4$

8. $y = \ln|3x|$

9. $y = \sin^{-1}(3x^2)$

10. Use the product rule to find $\frac{dy}{dx}$ if $y = (x^2 - 5)(x^3 + 3)$

11. Use the quotient rule to find $f'(x)$ if $f(x) = \frac{x^2 - 2}{x^3 + 4x + 2}$

12. Use the chain rule to find $f'(x)$ if $f(x) = (5x^3 - 8)^7$

Be sure you can solve problems of optimization. Write an outline of how to do optimization problems.

13. A rectangular page is to contain 24 square inches of print. The margins at the top and bottom of the page are to be $1\frac{1}{2}$ inches, and the margins on the left and right are to be 1 inch. What should the dimensions of the page be so that the least amount of paper is used?

14. A farmer plans to fence a rectangular pasture adjacent to a river. The pasture must contain 180,000 square meters in order to provide enough grass for the herd. What dimensions would require the least amount to fencing if no fencing is needed along the river?

Be sure that you can solve problems of related rates. Write an outline of how to do related rate problems.

15. At a sand and gravel plant, sand is falling off a conveyor and onto a conical pile at a rate of 10 cubic feet per minute. The diameter of the base of the cone is approximately three times the altitude. At what rate is the height of the pile changing when the pile is 15 feet high?
16. A spherical balloon is inflated with gas at the rate of 800 cubic centimeters per minute. How fast is the radius of the balloon increasing at the instant that the radius is 30 centimeters? 60 centimeters?
17. Discuss the curve $y = x^4 - 12x^3 + 48x^2 - 64x$. List x and y intercepts, intervals on which the function is increasing or decreasing, critical numbers, local maxima and minima, intervals on which the function is increasing, decreasing, concave up, concave down and any points of inflection.