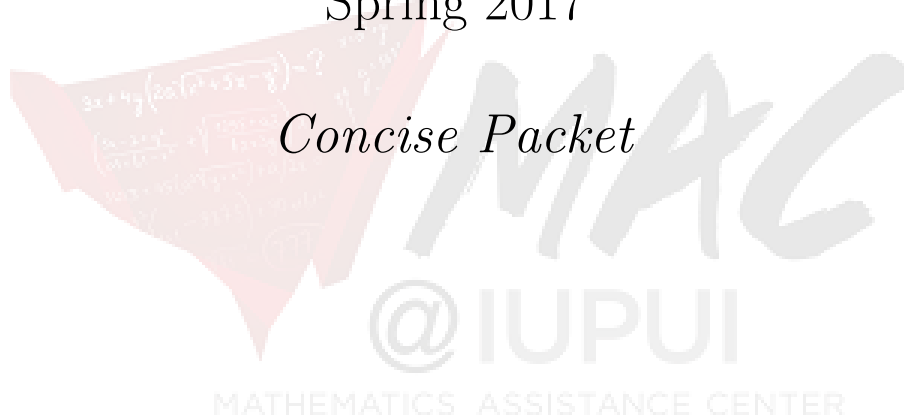


**M119 Exam Jam**  
Spring 2017

*Concise Packet*



1. Find the average rate of change of  $f(x) = x^2 - 3$  between  $x = 1$  and  $x = 5$
2. Find the instantaneous rate of change of  $f(x) = x^4 - 3x^2 + 2$  at  $x = 4$
3. Find  $f'(-1)$  if  $f(x) = x^5 - 3x^4 + 1$
4. Differentiate:  $y = 8\sqrt{x} - \frac{2}{x^3}$
5. If  $g(t) = e^{-4t}$  find  $g''(0)$
6. Find  $\frac{d^2y}{dx^2}|_{x=4}$  if  $y = \ln x$
7. Find the slope of the line tangent to  $f(x) = x^4 + 7x - 8$  at  $x = 0$
8. Find an equation for the line tangent to the graph of  $y = 3x^2 - x$  at  $x = -1$
9. Find an equation for the line tangent to the graph of  $f(x) = e^{3x} + 2x + 1$  at  $x = 0$
10. Given that  $y = 5(x^4 - 2)^3$ , find  $\frac{dy}{dx}|_{x=1}$
11. Given  $y = 2 \ln(5x^3 - x)$ , find  $\frac{dy}{dx}$
12. If  $P(t) = 200te^{0.04t}$ , find  $P'(t)$
13. Given  $f(z) = z^5 \ln z$ , find  $f'(z)$
14. Find all points where the tangent line is horizontal:  $f(x) = x^3 - 3x^2 - 9x$
15. Given  $f(x) = 16x - x^2$ , find all points where the tangent line is horizontal.
16. For  $f(x) = x^4 + 4x^3 + 10$ , find the critical points, and then determine if each point is a local minimum, local maximum, or neither.
17. Given that  $g(t) = t^3 - 3t^2 + 3t - 2$ , find the inflection points.
18. Find the absolute maximum and absolute minimum values of the function on the given interval:  $f(x) = x^2 - 10x$  on the interval  $[0, 6]$
19. At a price of \$20 per ticket, a group can fill every seat in a theater with 930 seats. For every additional dollar charged, the number of people buying tickets decreases by 30.
  - a. Find the revenue function (as a function of price).
  - b. Find the ticket price that maximizes the revenue.
  - c. What is the maximum revenue?
20. A company finds that the demand equation for a quantity  $q$  of Jphones sold at price  $p$ , in dollars is  $p = 870 - 3q$ . To produce these Jphones, the company finds that fixed costs are \$2875 and the variable cost per unit is \$126.
  - a. At what quantity is the profit maximized?
  - b. What is the maximum profit?

21. If the population of a town doubled in 15 years, find the continuous annual growth rate. Write your answer as a percent.
22. If money is invested in an account that pays interest compounded continuously at 2.9% per year, how long will it take for the investment to double. Write your answer with 1 decimal place and include units.
23. If the half-life of a medication is 9 hours, find the rate of decay.
24. If the decay rate for a substance is 4.2% per week, find the half-life. Give your answer with 1 decimal place and include units.
25. Find each of the following indefinite integrals:
- $\int (e^{5t} + t^5)dt$
  - $\int \frac{2}{x^5} dx$
  - $\int (\frac{1}{x^4} - \frac{4}{x})dx$
26. Evaluate each of the following definite integrals:
- $\int_1^2 2t^4 dt$
  - $\int_{-1}^1 (4x^3 - 1)dx$
  - $\int_{16}^{36} 3\sqrt{x}dx$
  - $\int_1^e \frac{5}{x} dx$
27. The marginal cost function of a product, in dollars per unit, is  $C'(x) = 6x^2 - 60x + 10$ . Find the total cost function if fixed costs are \$4,000.
28. Find the area of the region bounded by  $y = x^3 + 3$  and the x-axis over the interval  $[0, 2]$
29. Find the area of the region bounded by  $f(x) = 9 - x^2$  over the interval  $[-3, 3]$
30. Your business estimates that sales are growing continuously at a rate given by  $S'(t) = 3t^2 + 2$ , where  $S'(t)$  is given in dollars per day on day  $t$ . Find the accumulated sales for the first 5 days.
31. Find the present value of \$7,000 due 8 years from now if interest is compounded continuously at a rate of 2.5% per year.
32. Find the present value of a continuous income stream of \$7,000 per year for 8 years if interest is compounded continuously at a rate of 2.5% per year.