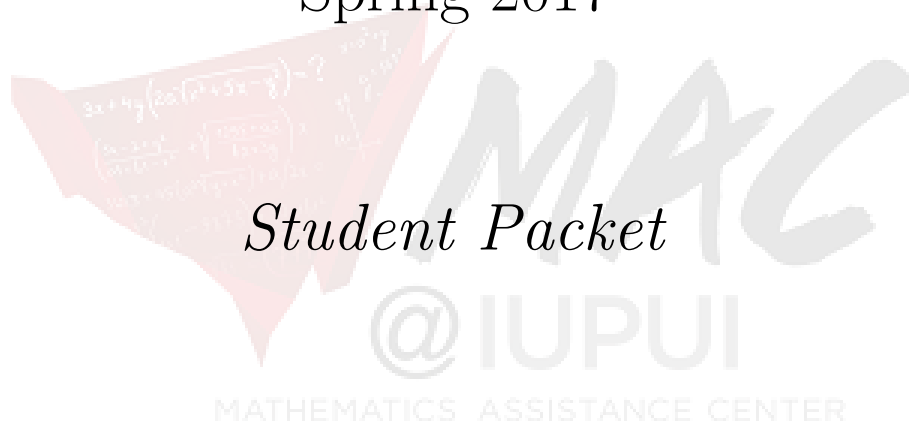


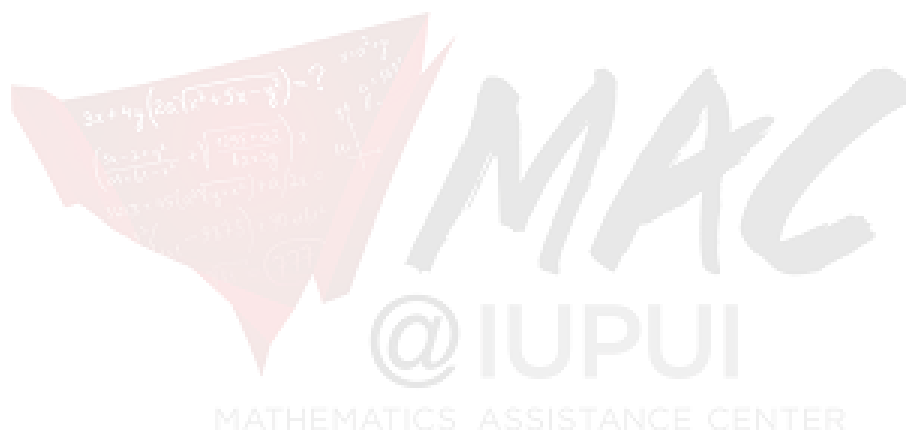
# M119 Exam Jam

Spring 2017

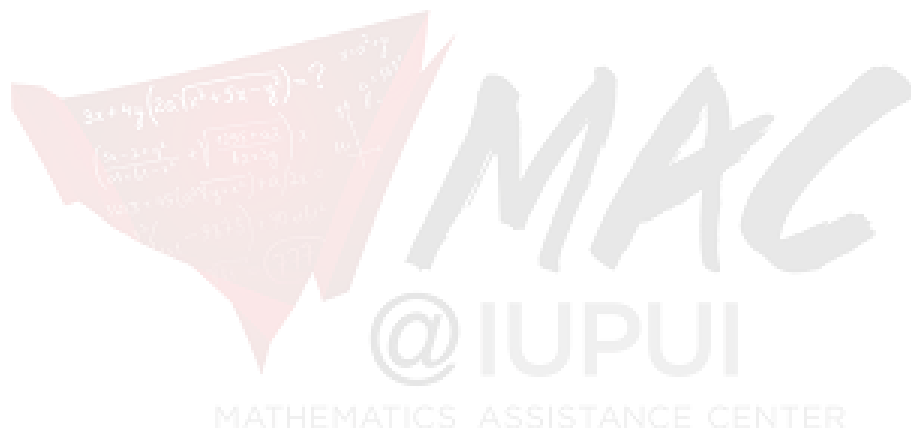
*Student Packet*



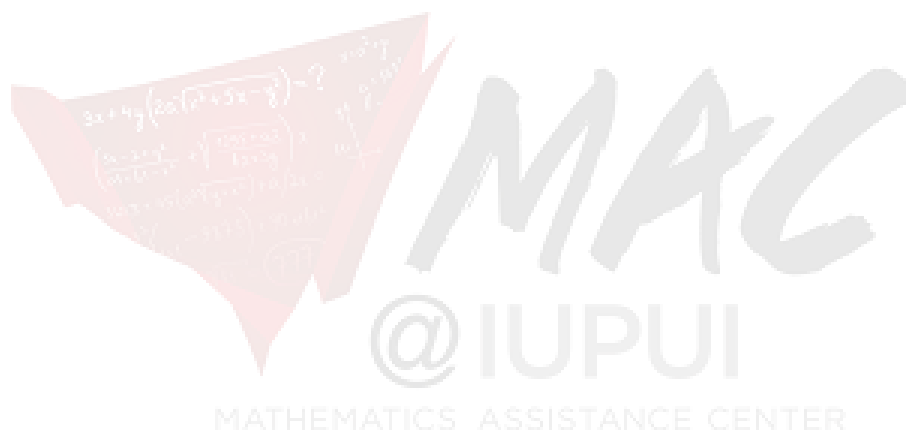
1. Find the average rate of change of  $f(x) = x^2 - 3$  between  $x = 1$  and  $x = 5$



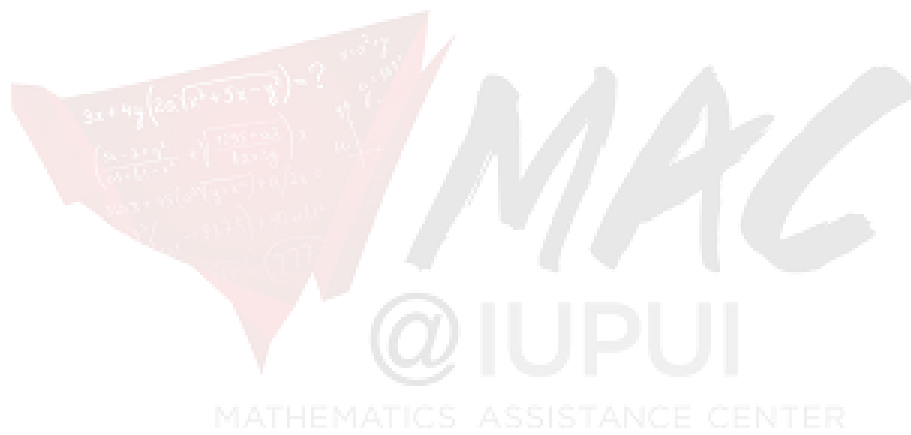
2. Find the instantaneous rate of change of  $f(x) = x^4 - 3x^2 + 2$  at  $x = 4$



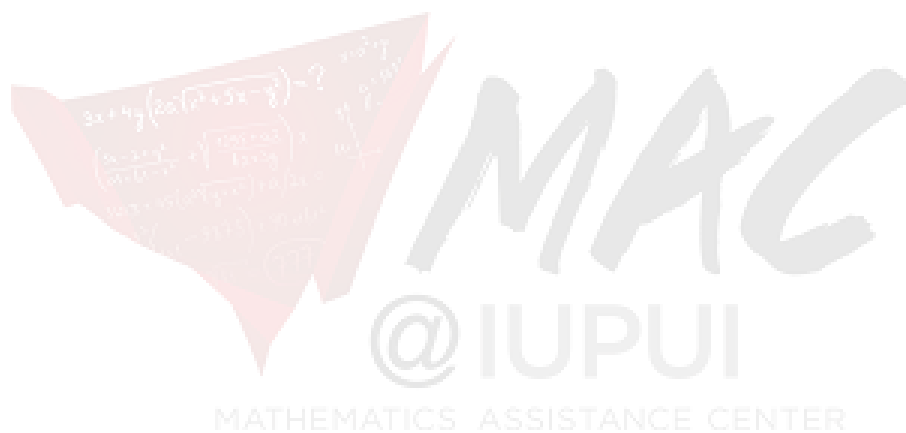
3. Find  $f'(-1)$  if  $f(x) = x^5 - 3x^4 + 1$



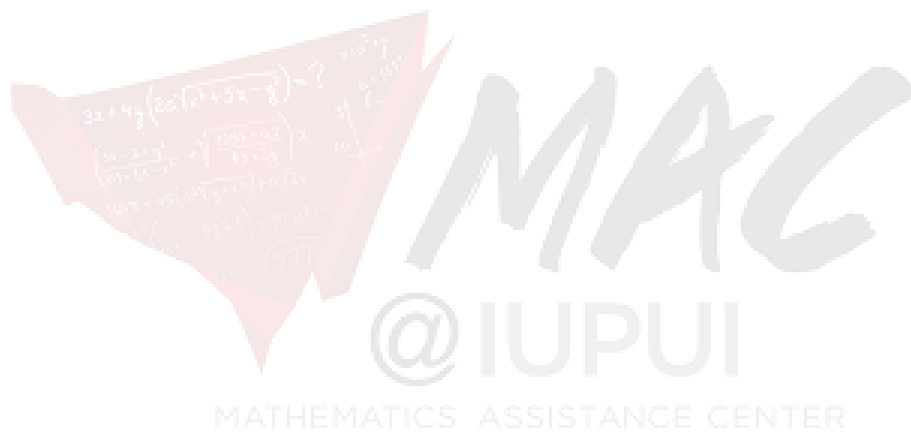
4. Differentiate:  $y = 8\sqrt{x} - \frac{2}{x^3}$



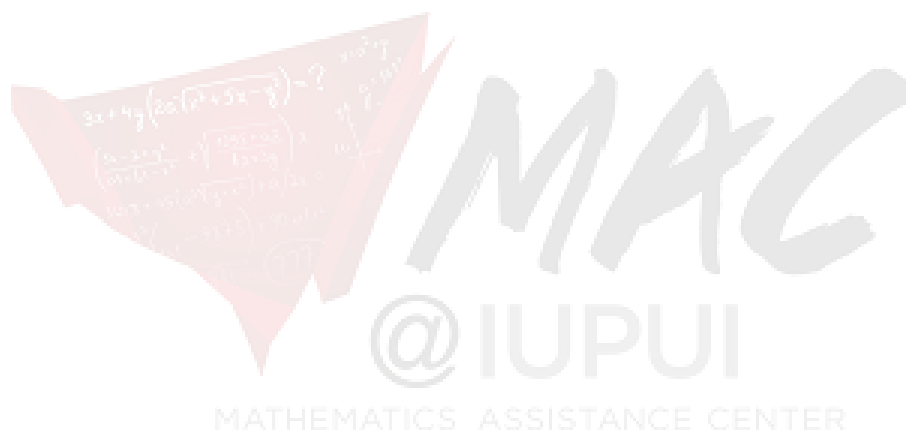
5. If  $g(t) = e^{-4t}$  find  $g''(0)$



6. Find  $\frac{d^2y}{dx^2}|_{x=4}$  if  $y = \ln x$

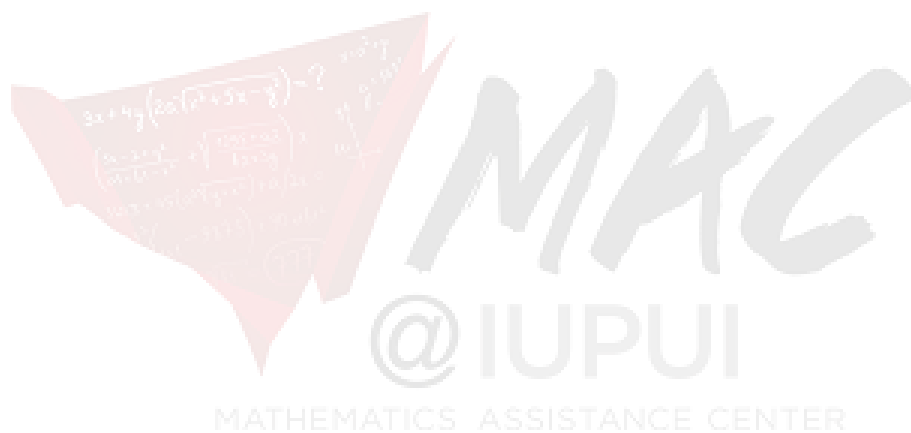


7. Find the slope of the line tangent to  $f(x) = x^4 + 7x - 8$  at  $x = 0$

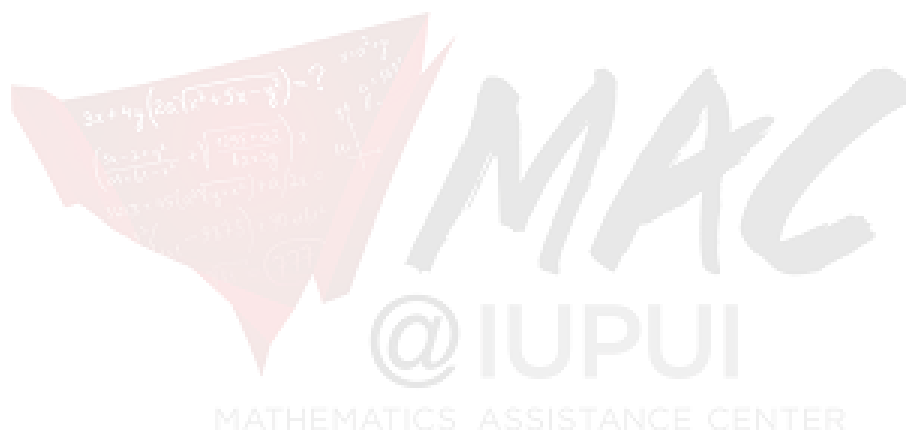




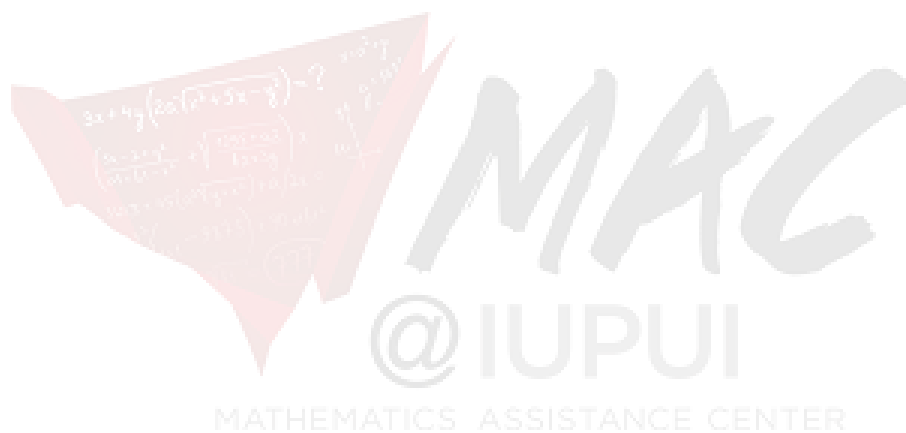
8. Find an equation for the line tangent to the graph of  $y = 3x^2 - x$  at  $x = -1$



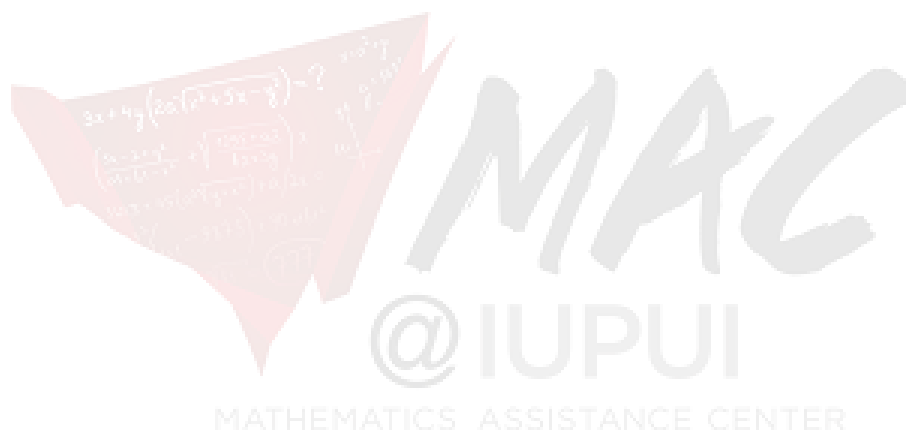
9. Find an equation for the line tangent to the graph of  $f(x) = e^{3x} + 2x + 1$  at  $x = 0$



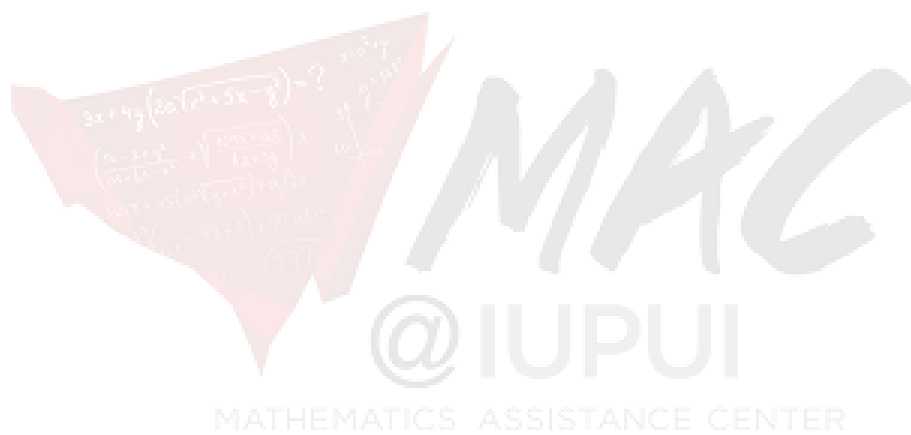
10. Given that  $y = 5(x^4 - 2)^3$ , find  $\frac{dy}{dx} \Big|_{x=1}$



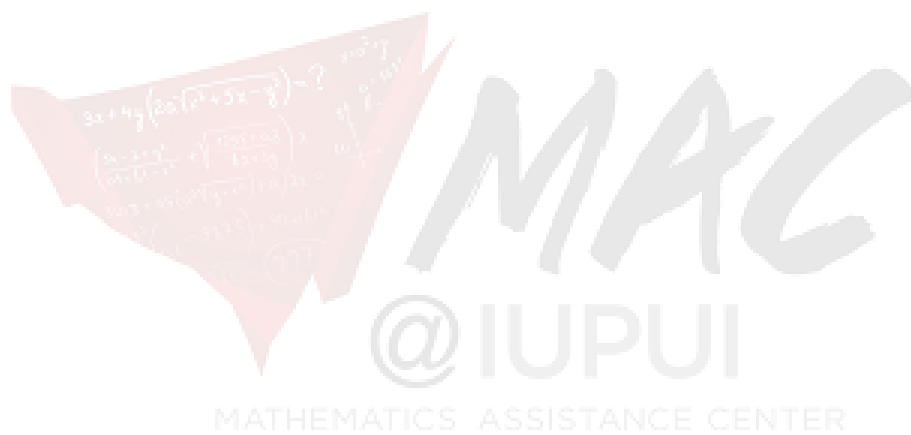
11. Given  $y = 2 \ln(5x^3 - x)$ , find  $\frac{dy}{dx}$



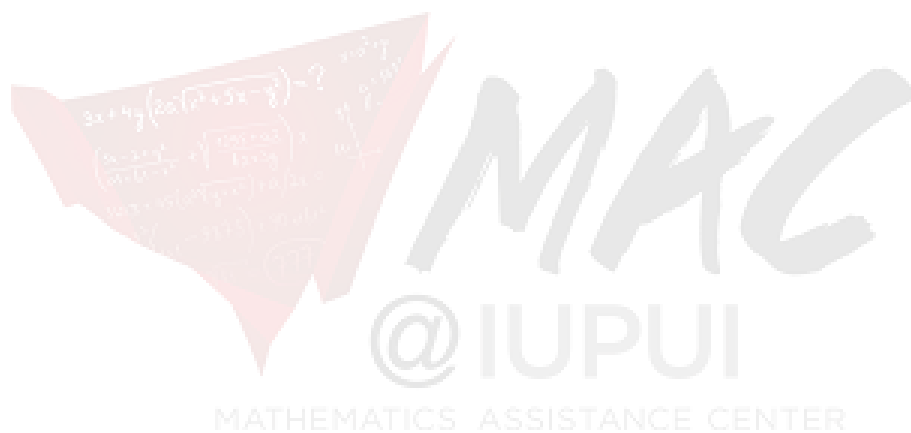
12. If  $P(t) = 200te^{0.04t}$ , find  $P'(t)$



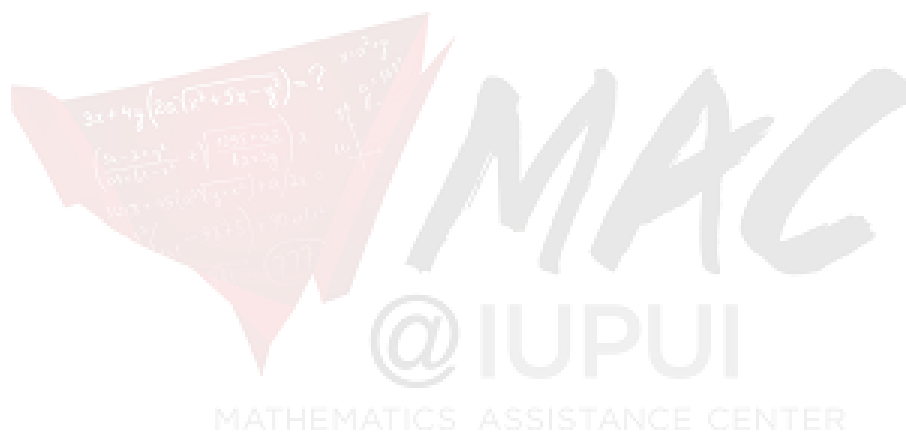
13. Given  $f(z) = z^5 \ln z$ , find  $f'(z)$



14. Find all points where the tangent line is horizontal:  $f(x) = x^3 - 3x^2 - 9x$

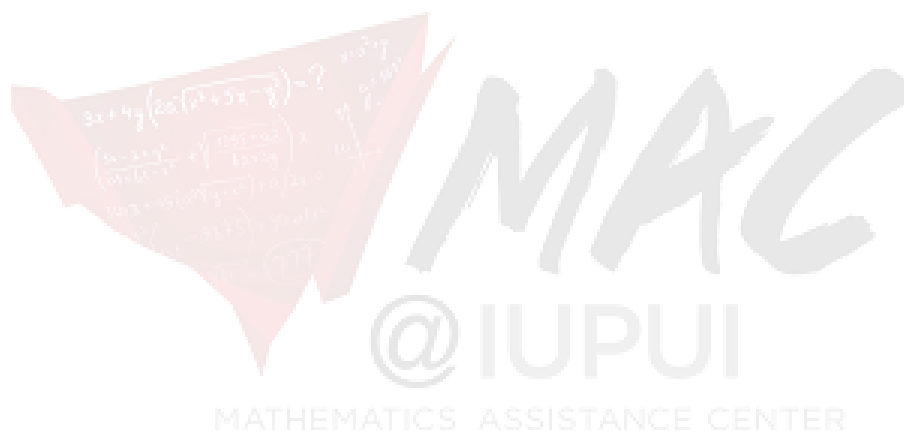


15. Given  $f(x) = 16x - x^2$ , find all points where the tangent line is horizontal.

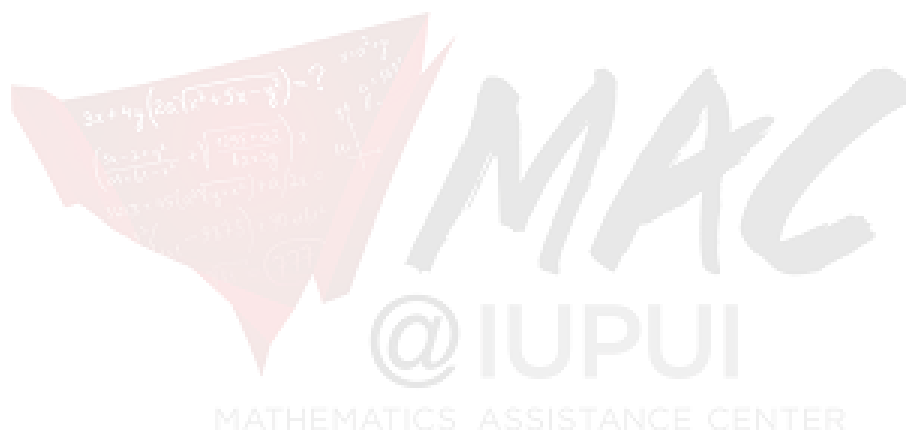




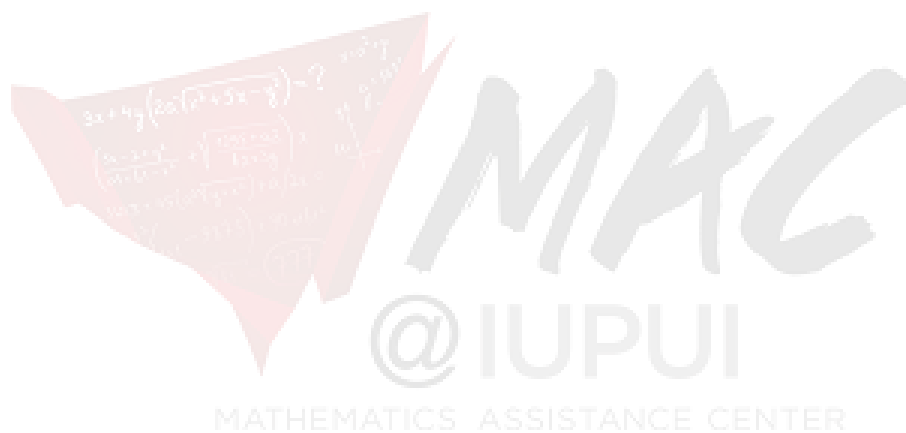
16. For  $f(x) = x^4 + 4x^3 + 10$ , find the critical points, and then determine if each point is a local minimum, local maximum, or neither.



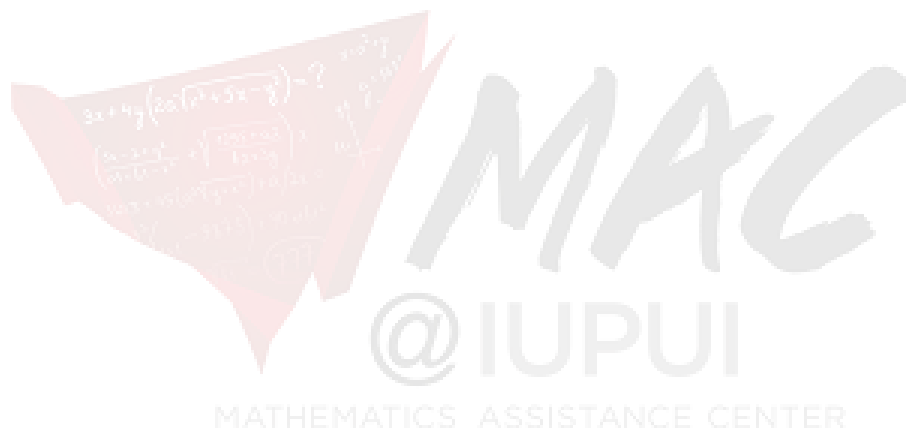
17. Given that  $g(t) = t^3 - 3t^2 + 3t - 2$ , find the inflection points.



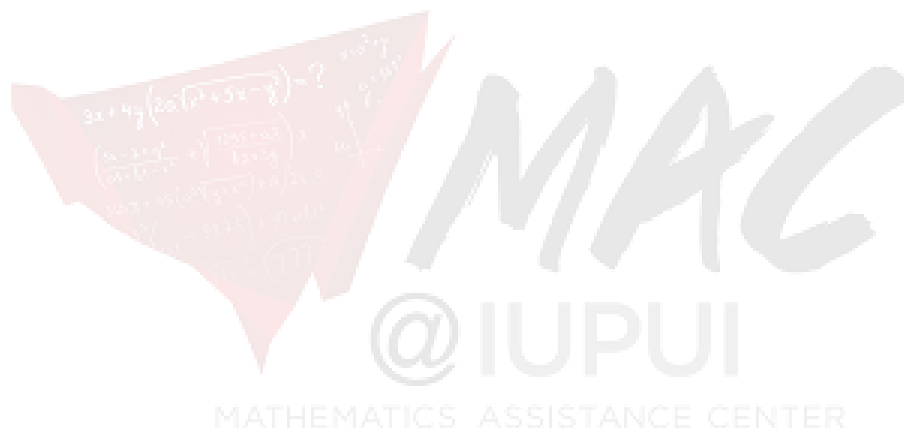
18. Find the absolute maximum and absolute minimum values of the function on the given interval:  $f(x) = x^2 - 10x$  on the interval  $[0, 6]$



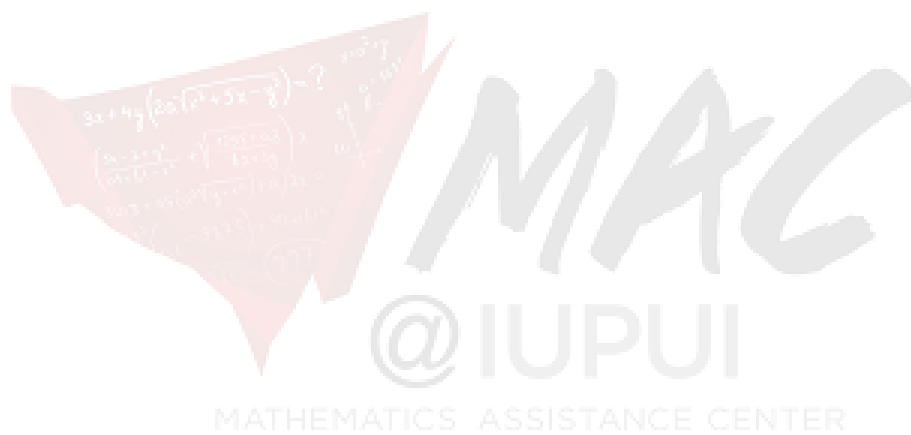
19. At a price of \$20 per ticket, a group can fill every seat in a theater with 930 seats. For every additional dollar charged, the number of people buying tickets decreases by 30.
- Find the revenue function (as a function of price).
  - Find the ticket price that maximizes the revenue.
  - What is the maximum revenue?



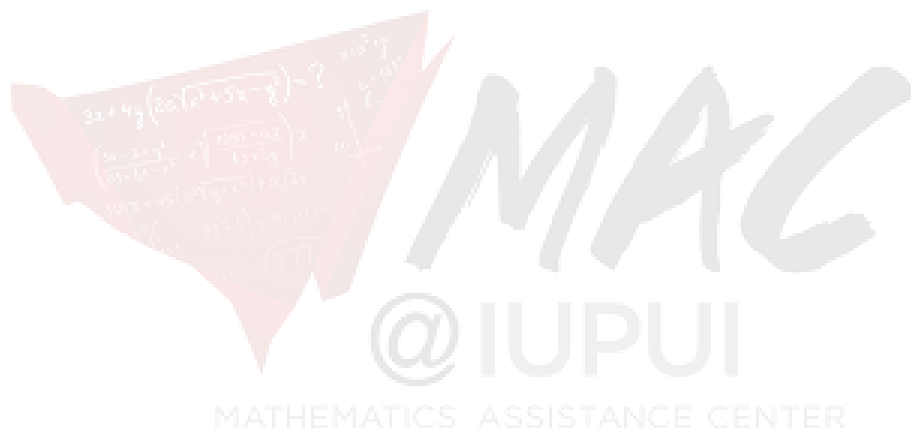
20. A company finds that the demand equation for a quantity  $q$  of Jphones sold at price  $p$ , in dollars is  $p = 870 - 3q$ . To produce these Jphones, the company finds that fixed costs are \$2875 and the variable cost per unit is \$126.
- At what quantity is the profit maximized?
  - What is the maximum profit?



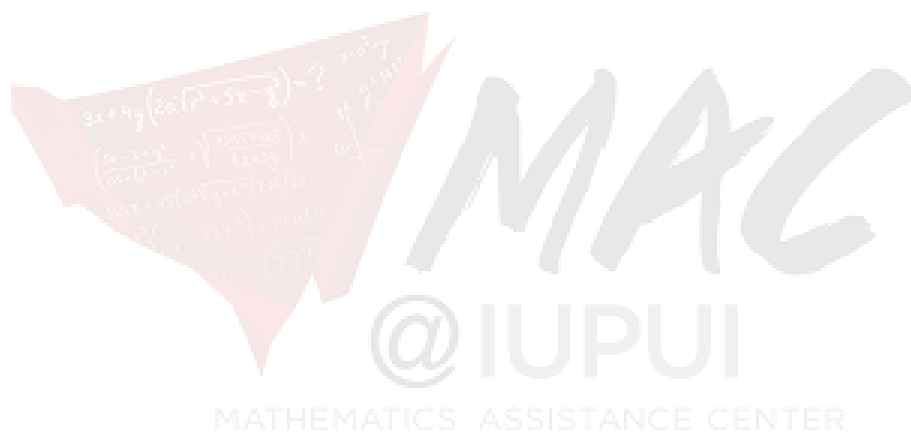
21. If the population of a town doubled in 15 years, find the continuous annual growth rate. Write your answer as a percent.



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.

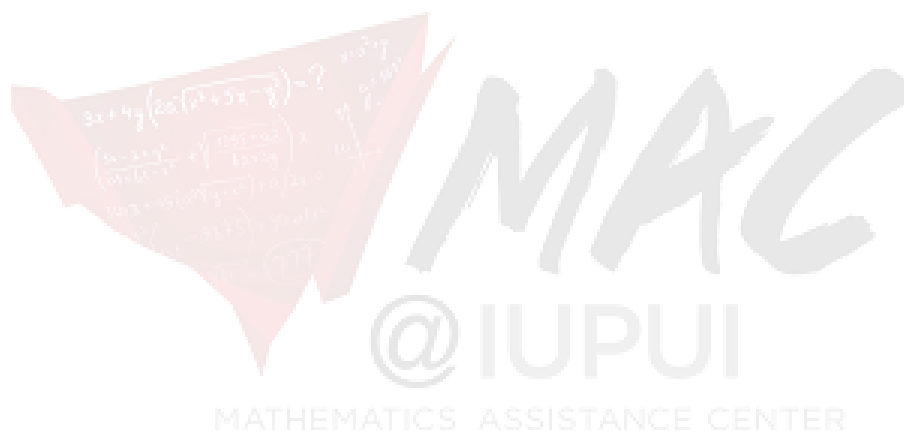


23. If the half-life of a medication is 9 hours, find the rate of decay.





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.

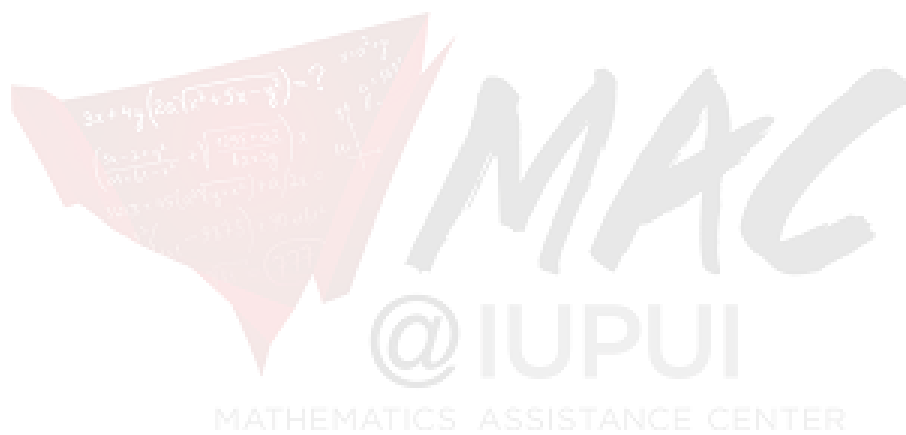


25. Find each of the following indefinite integrals:

a.  $\int (e^{5t} + t^5)dt$

b.  $\int \frac{2}{x^5}dx$

c.  $\int (\frac{1}{x^4} - \frac{4}{x})dx$



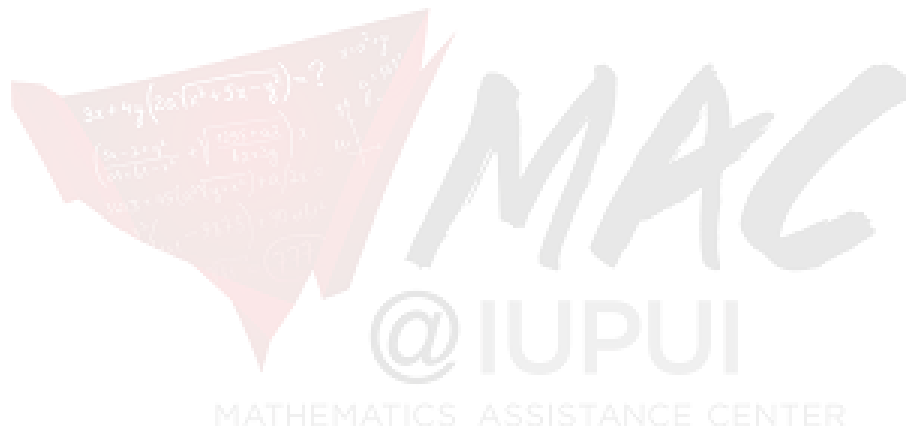
26. Evaluate each of the following definite integrals:

a.  $\int_1^2 2t^4 dt$

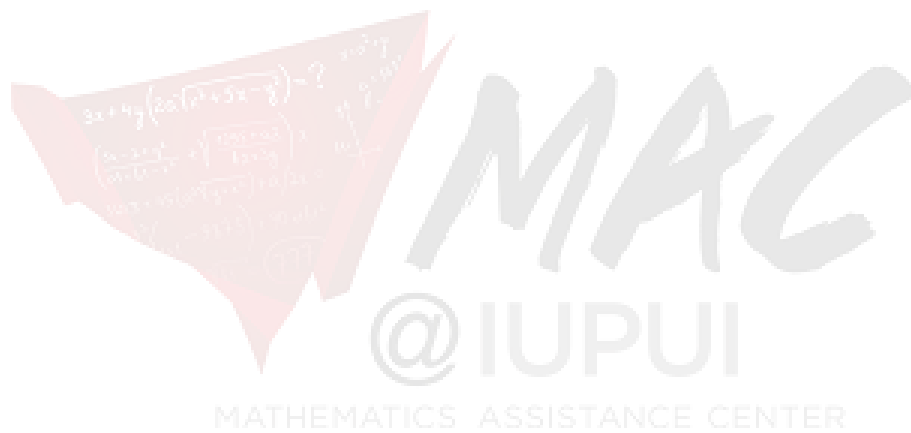
b.  $\int_{-1}^1 (4x^3 - 1) dx$

c.  $\int_{16}^{36} 3\sqrt{x} dx$

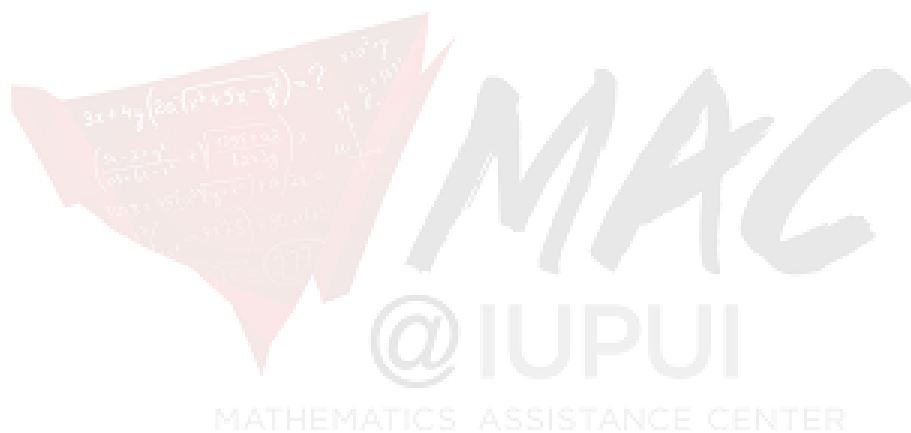
d.  $\int_1^e \frac{5}{x} dx$



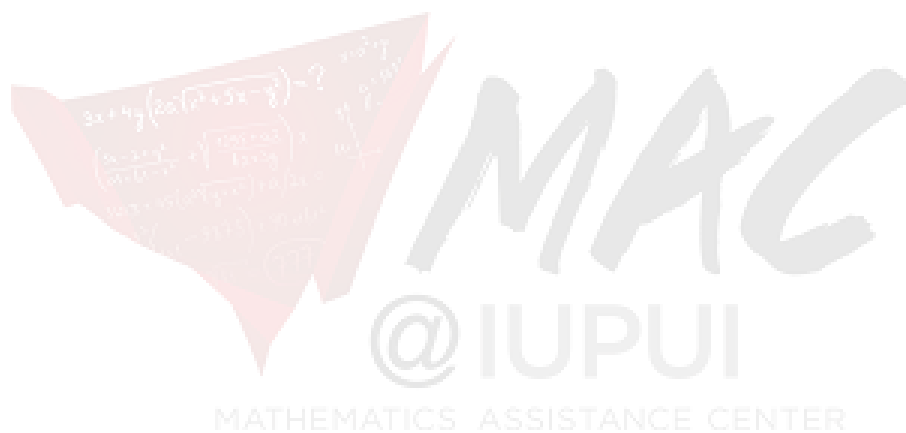
27. The marginal cost function of a product, in dollars per unit, is  $C'(x) = 6x^2 - 60x + 10$ . Find the total cost function if fixed costs are \$4,000.



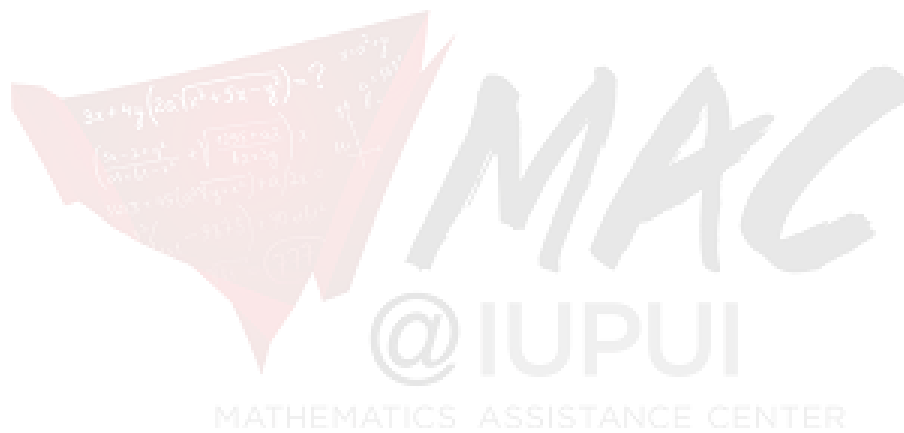
28. Find the area of the region bounded by  $y = x^3 + 3$  and the x-axis over the interval  $[0, 2]$



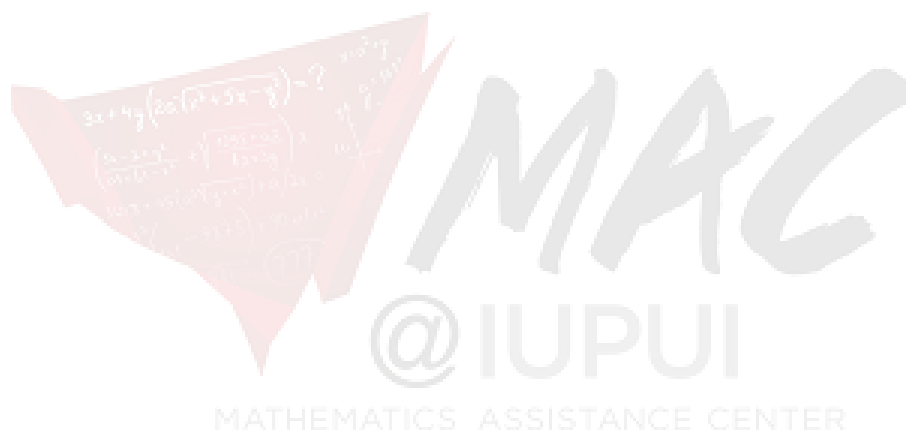
29. Find the area of the region bounded by  $f(x) = 9 - x^2$  over the interval  $[-3, 3]$



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.

