

Applied Calculus Exam 1

Do the problems in order in your bluebook. Show your work. Explain and justify your answers.

1. Find the equation of the line passing through the points $(1, -1)$ and $(5, 3)$.
2. Find the average rate of change of the function $f(x) = x^2$ from $x = 1$ to $x = 3$.
3. You are selling magic instant math pills. If you charge two dollars, you end up making 600 sales every week. Each quarter increase in price results in 15 fewer sales. Find and graph the demand curve.
4. A manufacturer of dongles has fixed costs of \$3000 and variable costs of \$16 per dongle. Find the cost equation. If dongles sell for \$31 each, find the break-even point.
5. In 1985, the city of erehwoN had a population of 248 thousand. This year the city's population is 400 thousand. Use an exponential model to estimate the yearly growth rate.
6. How is the graph of $y = f(x + 2) - 5$ gotten from that of $y = f(x)$?
7. A polynomial $f(x)$ has 2 local maximums. What is the least possible degree of $f(x)$?
8. You win the lottery and are given the choice of receiving 3 million dollars in equal annual payments over 4 years or a lump sum payment. Assuming a continuous annual return from investments of 12.5%, what would a fair lump sum payment be ?

Applied Calculus Exam 2

Do the problems in order in your bluebook. Show your work. Explain and justify your answers.

1. Find the equation of the line tangent to $y = \sqrt{x^2 + 7}$ at $x = 3$.
2. Let $P(t)$ be the price of a share of stock at time t . What does the statement “*the price of the stock is rising faster and faster*” tell us about the signs of $P'(t)$ and $P''(t)$?
3. Suppose cost is $C(x) = 33000 + 24x + \frac{3}{25} \ln(x^2 + 2x + 10)$. Find the marginal cost.
4. Suppose investing \$1000 for ten years at annual interest of $r\%$ compounded continuously yields a balance of $g(r)$ dollars. What does $g(5) = 1649$ and $g'(5) = 165$ tell you ?
5. Sketch a graph of a function whose derivative is always negative but whose derivative is always increasing.
6. Find the derivative of $y = \frac{x^3 - 4x + 2}{x^2 + 2^x + 2}$
7. Find the derivative of $g(x) = (4x^6 + x^5 - 2)^7 \cdot (5x^2 + \pi^2 - e^\pi)$

Applied Calculus Exam 3

Do the problems in order in your bluebook. Show your work. Explain and justify your answers.

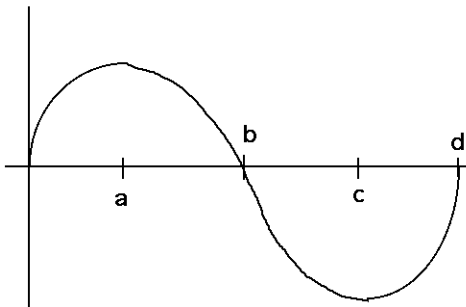
1. Set up (but do not compute) a Riemann sum using 4 rectangles and the left hand endpoint rule for the area bounded by $y = \ln(x)$ from $x = 2$ to $x = 3$. Draw a graph showing the rectangles.

2. Use the fundamental theorem of calculus to compute $\int_1^2 (3x^2 - \pi) dx$

3. Suppose $\int_a^b f(x) dx = 0$, what can you conclude about $f(x)$ over $a \leq x \leq b$?

4. Use the second derivative test to find and classify the critical points of $y = x^3 - 3x$.

5. The graph pictured below shows the velocity of a bicyclist as a function of time, where positive velocity indicates northward travel and negative velocity southern travel. At what time is the bicyclist furthest north ? Why ?



6. You decided to organize a calculus concert. At a price of \$20 a ticket, you can sell 450 tickets. Each dollar increase results in 30 fewer sales. Assuming a capacity of 510, what price should you charge to maximize revenue ?

7. At a production level of 5000, marginal revenue is less than marginal cost. Should you decrease or increase capacity in order to maximize profit ? Why ?