

Advanced Placement Calculus

Name _____

Copy original problem.

Per _____

Date _____

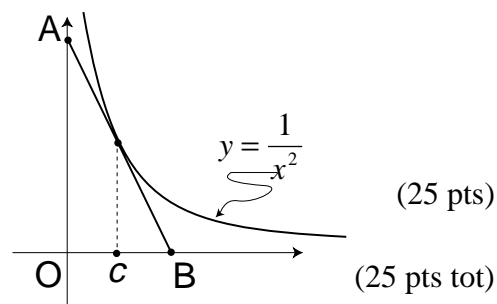
Convince *me* that **you** understand the concept!

No Calculators!

Hint: Draw properly labeled, useful figures. Be very clear in your reasoning and answer with a concise, meaningful sentence which indicates that you understand all the concepts involved. Finally, don't waste time justifying mathematics which are incomplete and rambling. Do the job requested and move on.

Chapter 6 Applications Exam

- I** Does the triangle, AOB , formed by the tangent line to $y = \frac{1}{x^2}$ and the axes increase or decrease in area as c gets larger? Explain. (25 pts)



- II** Find the dimensions of the rectangle (25 pts tot)

- ...of greatest area that can be inscribed in a semicircle of diameter two.
- ...of longest perimeter that can be inscribed in a semicircle of diameter two.
- Is it surprising that the answers to part (a) and part (b) are the same?

- III** Given: $f(x) = (1 + \tan x)^{\frac{3}{2}}$. (25 pts tot)

- Determine k where $k \leq x < \frac{\pi}{2}$ is the domain of $f(x)$.
- Determine the x -value of all extrema.
- Write the equation of the line tangent to $f(x)$ at $x = \frac{\pi}{4}$
- Write the equation of the line tangent to $f(x)$ at $x = 0$
- Using differentials, approximate $f(0.02)$

- IV** Let f be the function given by $f(x) = 2xe^{2x}$. (25 pts tot)

- Find $\lim_{x \rightarrow -\infty} f(x)$ and $\lim_{x \rightarrow \infty} f(x)$.
- Find the absolute minimum value of f .
- What is the range of f ?

Extra Credit ----- 5 pts -----

Continue with problem IV. Consider the family of functions defined by $y = bxe^{bx}$, where b is a nonzero constant. Show that the absolute minimum value of bxe^{bx} is the same for all nonzero values of b .