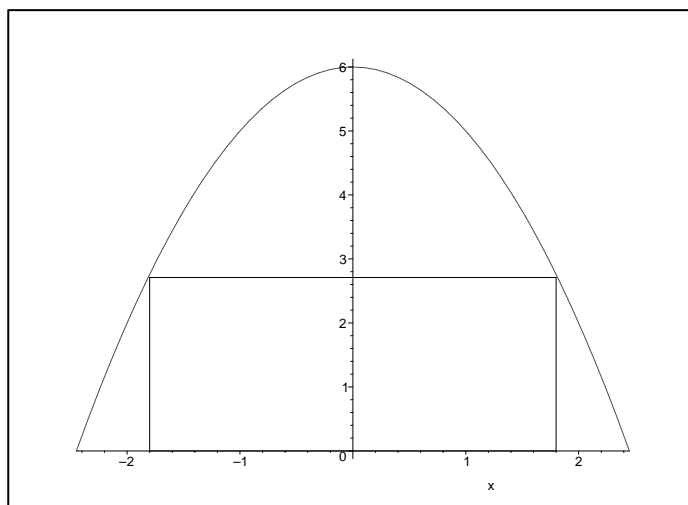


Exam 3, version A
Math 171.501
4/23/09

*An unsupported answer
is a wrong answer!*

- (5 pts.) Give a precise statement of the hypotheses and conclusion of the Mean Value Theorem.
- (15 pts.) Find the dimensions of the rectangle with largest area that has its base on the x axis and its other two vertices on the curve $y = 6 - x^2$ as shown below.



- (5 pts.) What are the domain and range of the function $f(x) = 4 \arccos(3x)$?
- (10 pts.) Find the function $f(x)$ which satisfies $f'(x) = \sin x + \frac{1}{1+x^2}$, and $f(0) = 4$.
- (10 pts.) For $f(x) = 2x + \ln x$,
 - find $f^{-1}(2)$. (Here, f^{-1} means inverse function, not reciprocal.)
 - find $(f^{-1})'(2)$.
- (10 pts.) Use logarithmic differentiation to find $\frac{dy}{dx}$ in terms of x if $y = \frac{2^x x^{(x+3)}}{\sqrt{x^4 + x^2 + 7}}$.
- (10 pts.) The population of fire ants in my back yard grows exponentially. At $t = 0$ there are 200 fire ants, and $t = 4$ days there are 300 fire ants. When will there be 1000 fire ants?

More problems on back!

8. (10 pts.) Determine $\lim_{x \rightarrow 0} \frac{1 - e^{3x^2}}{x^2}$.
9. (15 pts.) Let $f(x) = x + 2 \cos x$ on $(0, 2\pi)$.
- (a) On what open intervals is f increasing? On what open intervals is f decreasing?
 - (b) Determine the x coordinates of any critical points of f , and classify them as local maxima, local minima, or neither.
 - (c) On what open intervals is f concave up? On what open intervals is f concave down?
10. (10 pts.) For what x 's, if any, does $\ln(x) + \ln(2x + 3) = \ln 2$?