Unit 3: Extreme Value Theorem

Name: _____

(Absolute Extrema): refers to the maximum and minimum values of a function in a specified interval.

Extreme Value Theorem: (Max-Min Existence)
If $f$ *is continuous* on a closed interval [a,b], then $f$ attains both a maximum and minimum value there.

***Procedure:***

1. Find the derivative of the function.
2. Find the *critical numbers.*
   -Recall this refers to any value of *x*, where $f'(x) = 0$ OR $f'(x) = DNE$
3. Create a table of values by plugging the *x*-numbers found in step 2, and the endpoints of the interval, back into the original function.
   **Note:** Do not put any critical numbers into the table that are **not** included in the stated interval.
4. Identify the absolute maximum and minimum of the stated interval by comparing their *y*-values.
   **The maximium or minimum value can exist at the endpoints**
   **ONLY IF the stated interval is closed [ , ].**

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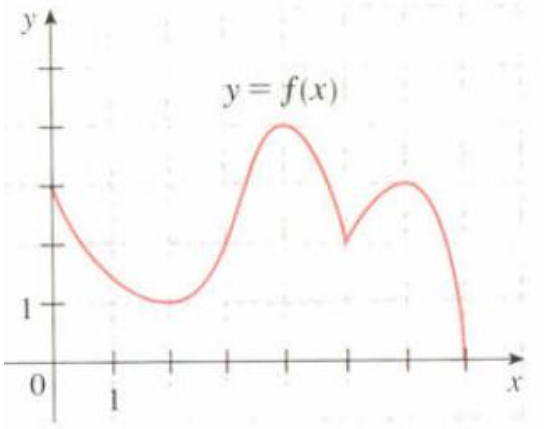
**Examples:**

1. Use the graph of f(x) to state the following:




a) absolute maximum and absolute minimum value

b) local maximum and minimum value(s).

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2. a) Find the maximum/minimum values of the function $f(x) = x^3 - 3x^2 - 9x + 4$ in the interval [– 4 , 2].

b) Consider the open interval (-4,2). Would your results change?

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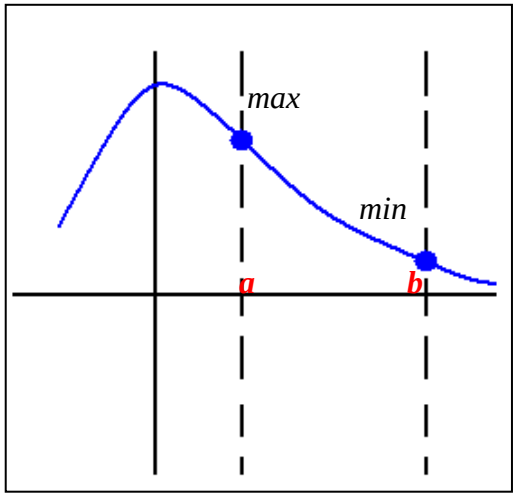
3. a) Find the maximum/minimum values of the function $f(x) = x^2 + \frac{2}{x}$ in the interval [-1 , 2].

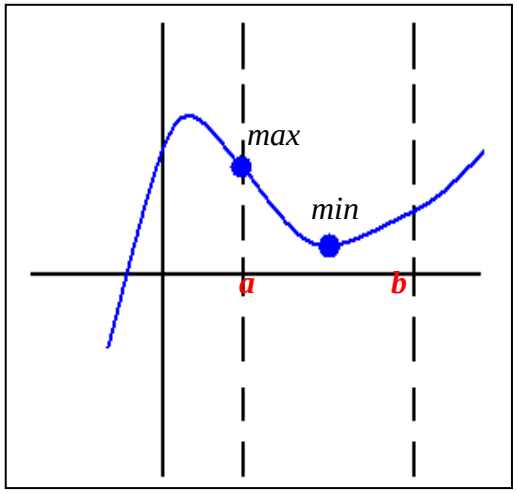
b) Consider the closed interval [.5,2]. Would your results change?

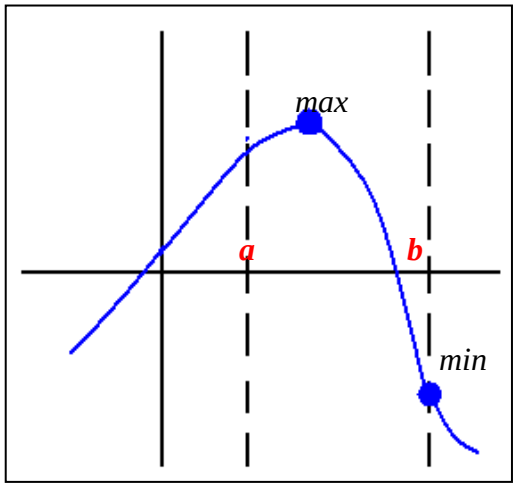
Name: _____

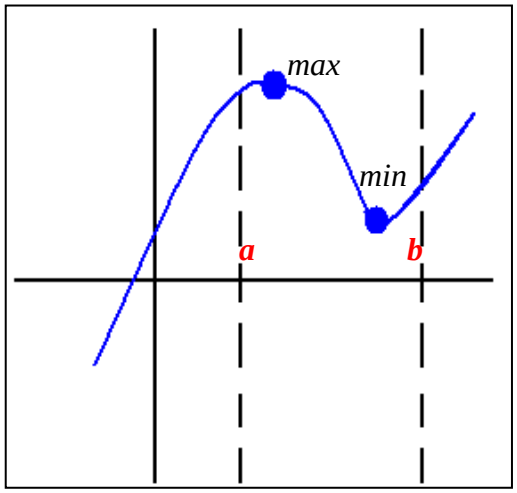
**Maximum and Minimum Values of a Function in an Interval**

**The interval is from *a* to *b* [*a*, *b*]**



Name: _____

# Unit 3 Worksheet 10
## AP Calculus AB

***Determine the absolute maximum and absolute minimum value over the stated interval by applying the Extreme Value Theorem.***

1. $f(x) = x^2 + 4x + 4$ $\quad [-4,0]$

2. $f(x) = x^2 + 3x$ $\quad [-2,1]$

3. $f(x) = x^3 - 3x + 1$ $\quad (-\frac{3}{2},3)$

4. $f(x) = x^3 - 3x^2$ $\quad [-1,3]$

5. $f(x) = x^3 - 12x$ $\quad (0,4)$

6. $f(x) = \dfrac{x}{x-2}$ $\quad [3,5]$

7. $f(x) = \dfrac{1}{x}$ $\quad [-1,3]$

8. $f(x) = \dfrac{1}{1+x^2}$ $\quad (-3,3)$

9. $f(x) = \sqrt[3]{x}$ $\quad [-1,27]$

10. $f(x) = \sqrt{9-x^2}$ $\quad [-1,2]$

Textbook Practice [4.2] pg. 279-280 #'s (3,4,6-10)