Rutgers University
Math 151

Sections 4.2-3: Mean Value Theorem and First Derivative Test - Worksheet

1. Find the values of the constants A, B for which the following function satisfies the assumptions of the Mean Value Theorem on the interval $[-2, 2]$.

$$f(x) = \begin{cases} e^{5x+B} & \text{if } x \geqslant 0 \\ \arctan(Ax+1) & \text{if } x < 0 \end{cases}$$

2. Suppose that f is continuous on $[-2, 4]$, that $f(4) = 1$ and that $f'(x) \geqslant 3$ for x in $(-2, 4)$. Find the largest possible value of $f(-2)$.

3. Find and classify the critical points of the following functions.

   (a) $f(x) = x^{4/7}(72 - x^2)$

   (b) $f(x) = x^5 \ln(x)$

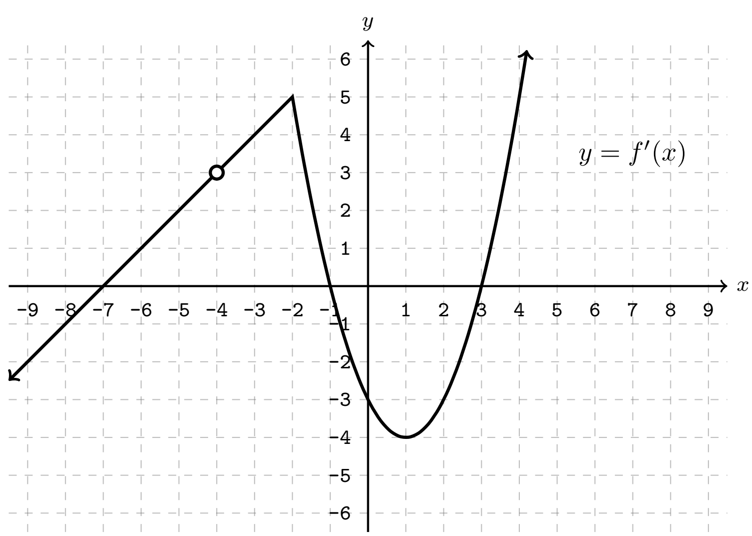
   (c) $f(x) = x + \cos(2x)$ on $\left[0, \frac{\pi}{2}\right]$

   (d) $f(x) = \sin^{-1}\left(e^{-x^2}\right)$

4. Suppose that f is continuous on $(-\infty, \infty)$ and that $f'(x) = \dfrac{(x+3)(x-5)^2}{x^{2/3}(x-1)^{1/5}}$.

   (a) Find the critical points of f.
   (b) Find the intervals where f is increasing and the intervals where f is decreasing.
   (c) Find the location of the local extrema of f.

5. Suppose that f is a differentiable function. The graph of the **derivative** of f, $y = f'(x)$, is sketched below.



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(b) Find the intervals where f is increasing and the intervals where f is decreasing.

(c) Find the location of the local extrema of f.