1. Shown here is the graph of the first derivative of some function $\mathrm{f}(\mathrm{x})$. Is $f$ concave up or concave down over the interval $(3,4)$ ? Justify your response.

2. Using the above graph, give an interval for which $f$ is decreasing but concave up.

For 3 and 4 , refer to the function $f(x)=5 x^{4}-x^{5}$. Calculations/analysis do not need to be repeated if you need to make reference to the other problem.

D-AD11
3. Find any inflection points for the function $f(x)$. Justify your response.

## D-AD12

4. Find the interval(s) over which $f(x)$ is concave up. Justify your response.

D-AD13
5. Find any intervals for which $f(x)=2 x^{4}-4 x^{2}-3$ is decreasing and concave up. Show the calculations that lead to your conclusion.

D-AD7
6. Shown here is $f^{\prime}(x)$ the first derivative of $f(x)$. Give any interval(s) where $f(x)$ is increasing. Justify.

7. Does $f(x)$ have any relative minima? If so, give the $x$-coordinate. If not, explain why not.

## D-AD8

8. Find the absolute extrema for $f(x)=-x^{3}+2 x^{2}+4$ on the interval $[-1,1]$
9. Find and classify any relative extrema. Justify your classifications. $f(x)=-x^{4}+2 x^{2}-4$

D-AD9
10. For what interval(s) is the function $f(x)=x^{3}+3 x^{2}-9 x+7$ increasing? Justify your answer.

