

Name: \_\_\_\_\_

Mark: \_\_\_\_\_

**Mini-math Div 3/4: Friday, January 14, 2022 (15 minutes)**

1. Consider the function whose derivative is  $f'(x) = \frac{(x+4)^5(x-3)^2(x-\frac{1}{7})}{(x-1)^{1/3}}$

(a) (3 points) Find the interval(s) on which the original function  $f$  is increasing.

(b) (2 points) Find and classify the local extrema of  $f$ .

2. (3 points) Find the global maximum and minimum of  $f(x) = 2x^3 - 9x^2 - 10$  on  $[1, 4]$ .

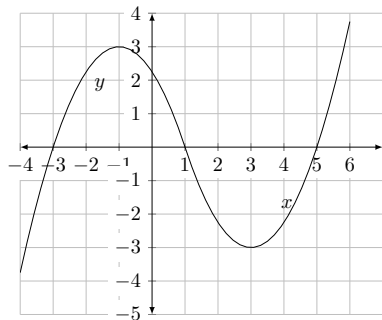
3. (3 points) Consider the function

$$f(x) = \frac{3}{5}x^5 + 4x^4 + 8x^3 + 12x + 10.$$

Find the interval(s) on which  $f$  is concave down.

4. (2 points) Suppose there is a function  $f(x)$  such that  $f'(x) = 0$  if and only if  $x = 0, 1$ , and whose **second derivative** is given by  $f''(x) = \frac{x^3 + x^2 - x}{(x+1)^2}$ . What would the Second Derivative Test tell you about the critical points  $x = 0$  and  $x = 1$ ?

5. (2 points) Assume  $f$  is a continuous function such that the following is a graph of  $f'$ . Find the points of inflection of  $f$ .



6. (1 point) (AP) Which of the following functions does not satisfy the conditions of the Mean Value Theorem on the interval specified?

(A)  $f(x) = \frac{1}{x}$  on  $[1, 4]$

(C)  $f(x) = \sqrt[3]{x}$  on  $[-1, 1]$

(B)  $f(x) = \sqrt{x}$  on  $[0, 2]$

(D)  $f(x) = x^2 - 1$  on  $[-2, 2]$

7. (1 point) (AP) Given the curve  $y3^y = \sin x$ , for what value of  $y$ , if any, does the derivative of  $y$  with respect to  $x$  not exist?