

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

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

**Mini-math Div 3/4: Monday, December 7, 2020 (12 minutes)**

1. Determine all horizontal and vertical asymptotes of the following functions, or indicate there are no such asymptotes. (Show your work for vertical asymptotes via a sign analysis)

(a) (2 points)  $f(x) = \frac{3x^2 - 9x}{x^2 - 2x - 3}$

(b) (2 points)  $f(x) = \frac{2x^3 + 10x}{x^2 + 3x + 2}$

2. (2 points) Consider the function  $f(x) = x^4 + 6x^3 + 12x^2 + x + 1$ . Find the interval(s) on which  $f$  is concave up.