QUIZ 5 MATH 211, BUSINESS CALCULUS, SPRING 2014 NAME:
SECTION:

Find all critical points, relative max/mins, and the intervals of increasing / decreasing. Please box your final answers.

1. Let $g(x) = 3x^5 - 5x^3$.

   (a) Find $f'(x)$

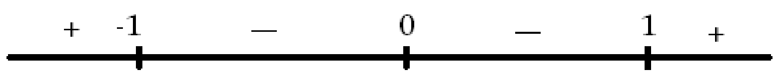
   $$f'(x) = 15x^4 - 15x^2 = 15x^2(x^2 - 1)$$

   (b) Set $f'(x) = 0$ and solve.

   $$\begin{aligned} 15x^2(x^2-1) &= 0 \\ 15x^2(x-1)(x+1) &= 0 \end{aligned}$$

   So critical numbers are $x = 0$, $x = -1$, and $x = 1$.

   (c) Use the numberline to find intervals of increasing / decreasing



   Test Points:

   $$\begin{aligned} f'(-2) &= 15(-2)^4 - 15(-2)^2 = 180 \text{ (pos)} \\ f'(-1/2) &= 15(-1/2)^4 - 15(-1/2)^2 = -2.8125 \text{ (neg)} \\ f'(-1/2) &= 15(1/2)^4 - 15(1/2)^2 = -2.8125 \text{ (neg)} \\ f'(2) &= 15(2)^4 - 15(2)^2 = 180 \text{ (pos)} \end{aligned}$$

   (d) Intervals of Increasing / Decreasing:

   Increasing: $(-\infty, -1) \cup (1, \infty)$

   Decreasing: $(-1, 1)$

   (e) Local Extrema:

   Max: $(-1, 2)$

   Min: $(1, 2)$

2. Let $\dfrac{x}{x+1}$.

(a) Find $f'(x)$

$$f'(x) = \frac{(x+1)(1) - x(1)}{(x+1)^2} = \frac{1}{(x+1)^2}$$

(b) Set $f'(x) = 0$ and solve. This is equivalent to setting the numerator equal to 0.

$$\frac{1}{(x+1)^2} \Rightarrow 1 = 0$$

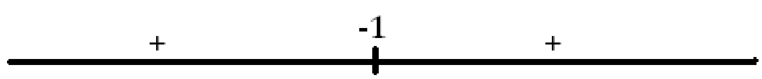
which never happens. So $f'(x) \neq 0$.

(c) When does $f'(x)$ not exist? This is equivalent to setting the denominator equal to 0.

$$(x+1)^2 = 0 \Rightarrow x = -1$$

So critical number is just $x = -1$.

(d) Use the numberline to find intervals of increasing / decreasing



Test Points:

$$f'(-2) = \frac{1}{((-2)+1)^2} = 1 \text{ (pos)}$$

$$f'(2) = \frac{1}{((2)+1)^2} = 1/9 \text{ (pos)}$$

(e) Intervals of Increasing / Decreasing:

Increasing: $(-\infty, -1) \cup (-1, \infty)$

Decreasing: Never

(f) Local Extrema:

Max: None

Min: None