

QUIZ MATH 151 Sections 525-527

WEEK 12

NAME _____ SECTION _____

Show all your work and box your final answer.

- [25pts] Find the critical numbers of the function $f(x) = 2x^3 - 9x^2 - 12x - 7$.
- [25pts] Find the absolute maximum and absolute minimum values of $f(x) = x^2 - 2x - 3$ on the interval $[-2, 0]$.
- [25pts] Evaluate $\lim_{x \rightarrow \infty} \frac{x^2 - 15x + 11}{e^x}$.
- [25pts] Evaluate $\lim_{x \rightarrow 0^+} x \ln x$.

① $F'(x) = 0$ gives C.V.'s, $\Rightarrow f'(x) = 6x^2 - 18x - 12 = 0$
 $\Rightarrow 6(x^2 - 3x - 2) = 0$ Must use
 Quadratic formula $\Rightarrow x = \frac{3 \pm \sqrt{9 - 4(1)(-2)}}{2} \Rightarrow \boxed{x = \frac{3 \pm \sqrt{17}}{2}}$

② Find value of function at critical values inside the domain interval and the function values at the domain endpoints.

C.V.'s: $f'(x) = 2x - 2$
 $\Rightarrow x = 1$ is critical value

But 1 is not in $[-2, 0]$, the interval,

so $f(-2) = 5$, $f(0) = -3$

So 5 is abs. max,
 and -3 is abs. min on interval $[-2, 0]$

③ $\lim_{x \rightarrow \infty} \frac{x^2 - 15x + 11}{e^x} = \frac{\infty}{\infty}$. Use L'Hopital's Rule twice

$= \lim_{x \rightarrow \infty} \frac{2x - 15}{e^x} = \frac{\infty}{\infty} = \lim_{x \rightarrow \infty} \frac{2}{e^x} \rightarrow \frac{2}{e^{\infty}} \text{ as } x \rightarrow \infty, = 0$

④ $\lim_{x \rightarrow 0^+} x \ln x = \lim_{x \rightarrow 0^+} \frac{\ln x}{\frac{1}{x}} = \lim_{x \rightarrow 0^+} \frac{\frac{1}{x}}{-\frac{1}{x^2}} = \lim_{x \rightarrow 0^+} \frac{-x^2}{x} = \lim_{x \rightarrow 0^+} -x = 0$
 L'Hopital's Rule