Math 106, Sect. 350 **Answers to Quiz # 7** **19 Oct '06**

. 5 1. Find all extrema of $f(x) = (x^3 - 2x^2)e^x$, on the interval $-7 \leq x \leq 2.1$.

Solution.

$$\begin{aligned} f'(x) &= (3x^2 - 4x)e^x + e^x(x^3 - nx^2) \\ &= e^x(x^3 + 3x^2 - 2x^2 - 4x) \\ &= e^x(x^3 + x^2 - 4x). \end{aligned}$$

To find the extrema values we set the derivative to 0 and solve for x, So $f'(x) = e^x(x^3 + x^2 - 4x) = 0$, and now we solve $e^x = 0$ and $(x^3 + x^2 - 4x) = 0$. Since e^x is never zero, we now need to solve for $(x^3 + x^2 - 4x) = 0$. Factoring out an x and using the quadratic equation, we get three roots: $x = \{0, \frac{-1+\sqrt{17}}{2}, \frac{-1-\sqrt{17}}{2}\}$.

. 5 2. For the previous question, which value is the absolute maximum? Which value is the absolute minimum?

Solution. By testing all our extremas and the endpoints we find the absolute max and min.

x	y	
-7	$\approx -.40213$	
-0	0	
$\frac{-1+\sqrt{17}}{2}$	≈ -5.0957	Absolute Minimum
$\frac{-1-\sqrt{17}}{2}$	≈ -2.3102	
2.1	≈ 3.60128	Absolute Maximum

So the absolute maximum is at $x = 2.1$ and the absolute minimum is at $x = \frac{-1+\sqrt{17}}{2}$.