Math 119 HW #7

Section 4.5 #13, 39

Section 5.1 #15, 48

Section 5.2 #20

4.5 #13 $s = t^2 \ln|t|$

$\frac{ds}{dt} = t^2 \cdot \frac{1}{t} + \ln|t| \cdot 2t$

4.5 #39 $w = \log_8 (2^p - 1)$

$\frac{dw}{dp} = \frac{1}{(2^p - 1)\ln 8} \cdot 2^p \ln 2$

5.1 #15 $f(x) = \frac{2}{3}x^3 - x^2 - 24x - 4$

$f'(x) = 2x^2 - 2x - 24$

$= 2(x^2 - x - 12)$

$= 2(x-4)(x+3)$

$\underline{f'(x) = 0}$: $2(x^2 - x - 12) = 0$

$x^2 - x - 12 = 0$

$(x-4)(x+3) = 0$

$x = 4,\ x = -3$ are the critical pts

x		-3		4	
$f'(x)$	$+++$	0	$---$	0	$+++$

$f'(-4) = 2(-4-4)(-4+3)$ pos

$f'(0) = 2(0-4)(0+3)$ neg

$f'(5) = 2(5-4)(5+3)$ pos

f is inc. on $(-\infty, -3)$ & $(4, \infty)$

f is dec. on $(-3, 4)$.

5.1 #48

$P(x) = -(x-4)e^{x} - 4$

$= (-x+4)e^{x} - 4$

$P'(x) = 0$: $e^{x}(-x+3) = 0$

$-x+3=0$

$3 = x$

$P'(x) = (-x+4)e^{x} + e^{x}\cdot(-1)$

$= e^{x}(-x+4-1)$

$= e^{x}(-x+3)$

$P'(0) = e^{0}(-0+3)$ pos

$P'(4) = e^{4}(-4+3)$ neg

(e^{x} is always pos.)

x		3	
$P'(x)$	+ + +	0	− − −

So $P(x)$ is inc on $(-\infty, 3)$

$P(x)$ is dec. on $(3, \infty)$

Since $0 < x \leq 3.9$, $P(x)$ is inc. on $(0, 3)$

$P(x)$ is dec. on $(3, 3.9]$

5.2 #20

$f(x) = x^{4} - 8x^{2} + 9$

$f'(x) = 0$: $4x(x-2)(x+2) = 0$

$x=0 \quad x=2 \quad x=-2$

$f'(x) = 4x^{3} - 16x$

$= 4x(x^{2}-4)$

$= 4x(x-2)(x+2)$

$f'(-3) = 4(-3)(-3-2)(-3+2)$ neg

$f'(-1) = 4(-1)(-1-2)(-1+2)$ pos

$f'(1) = 4\cdot 1(1-2)(1+2)$ neg

$f'(3) = 4\cdot 3(3-2)(3+2)$ pos

x		−2		0		2	
$f'(x)$	− − −	0	+ +	0	− − −	0	+ + +

So $x=-2$ is a rel. min

$x=0$ is a rel. max

$x=2$ is a rel. min.