# Math 121 HW # 11

Section 5.1: 4, 20, 32,

Section 5.2: 8, 26

**5.1 #4** inc. on $(3,\infty)$, dec. on $(-\infty, 3)$

**5.1 #20** $f(x) = 3x^4 + 8x^3 - 18x^2 + 5$

$f'(x) = 12x^3 + 24x^2 - 36x$

$f'(x) = 0$: $12x^3 + 24x^2 - 36x = 0$

$12x(x^2 + 2x - 3) = 0$

$12x(x+3)(x-1) = 0$

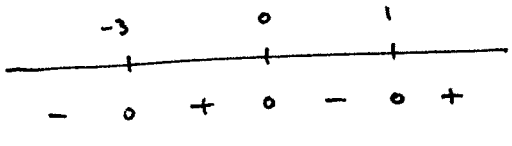
$x = 0, 1, -3$

$f'(-4) = \dots$

$f'(-2) = \dots$

$f'(\frac{1}{2}) = \dots$

$f'(2) = \dots$




So $f$ is inc. on $(-3,0) \cup (1,\infty)$

$f$ is dec. on $(-\infty,-3)$ and $(0,1)$

**5.1 #32** $f(x) = x e^{x^2-3x}$

$f'(x) = x \cdot e^{x^2-3x} \cdot (2x-3) + e^{x^2-3x} \cdot 1$

$= e^{x^2-3x}(x \cdot (2x-3) + 1)$

$= e^{x^2-3x}(2x^2 - 3x + 1)$

$= e^{x^2-3x}(2x-1)(x-1)$

$f' = 0$:

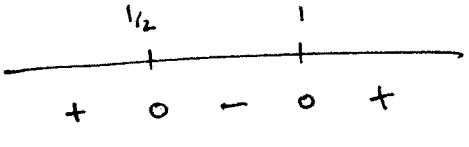
$e^{x^2-3x}(2x-1)(x-1) = 0$

$x = \frac{1}{2}, 1$

$f'(0) = e^0(-1)(-1) > 0$

$f'(\frac{3}{4}) = e^{-}(1.5-1)(\frac{3}{4}-1) < 0$

$f'(2) = e^{-}(3)(1) > 0$




$f$ is inc on $(-\infty, \frac{1}{2}) \cup (1,\infty)$

dec on $(\frac{1}{2}, 1)$

5.2 # 8 rel. max at $x=0$,
rel mins at $x=-3, 3$.

5.2 # 26 $f(x) = x^2 + \frac{1}{x} = x^2 + x^{-1}$

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

$f'=0$: $2x - \frac{1}{x^2} = 0$

$2x^3 - 1 = 0$

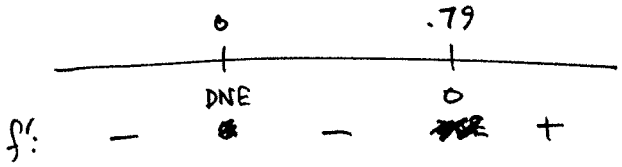
$2x^3 = 1$

$x^3 = 1/2$

$x = \sqrt[3]{1/2} \approx .79$

$f'$ DNE: $x^2 = 0$

$x = 0$

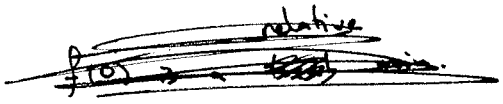



$f'(-1) = -2 - (-1)^{-2} < 0$

$f'(1/2) = 2 \cdot \frac{1}{2} - \left(\frac{1}{2}\right)^{-2}$

$= 1 - 4 < 0$

$f'(1) = 2 \cdot 1 - 1^{-2} = 2 - 1 > 0$




$f(\sqrt[3]{1/2})$ is a relative min