NAME: Solution

MAC 2311 Section 6462
Quiz Seven

Please show all of your work in a NEAT and ORGANIZED fashion.

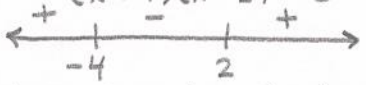
1. Let $f(x) = x^3 + 3x^2 - 24x + 5$.

(a) (1 point) Find the intervals on which f is increasing or decreasing.

$f'(x) = 3x^2 + 6x - 24 = 0$

$x^2 + 2x - 8 = 0$

$(x+4)(x-2) = 0$



inc: $(-\infty, -4) \cup (2, \infty)$

dec: $(-4, 2)$

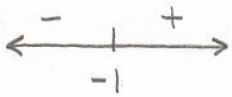
(b) (1 point) At what values of x does f have a local maximum or local minimum? **Explain**.

f has a local maximum at $x = -4$ because f' changes from positive to negative; f has a local minimum at $x = 2$ because f' changes from negative to positive.

(c) (1 point) Find the intervals of concavity ~~and any inflection points~~

$f''(x) = 6x + 6 = 0$

$x + 1 = 0$



concave up: $(-1, \infty)$

concave down: $(-\infty, -1)$

2. (3 points) Find the limit.

$$\lim_{x \to \infty} x^{e^{-x}}$$

$y = x^{e^{-x}} \longrightarrow \ln y = e^{-x} \ln x = \dfrac{\ln x}{e^x}$

$$\lim_{x \to \infty} \ln y = \lim_{x \to \infty} \frac{\ln x}{e^x} = \lim_{x \to \infty} \frac{1/x}{e^x} = \lim_{x \to \infty} \frac{1}{xe^x} = 0.$$

So $\lim_{x \to \infty} x^{e^{-x}} = \lim_{x \to \infty} y = \lim_{x \to \infty} e^{\ln y} = e^0 = 1.$