Name: Richard

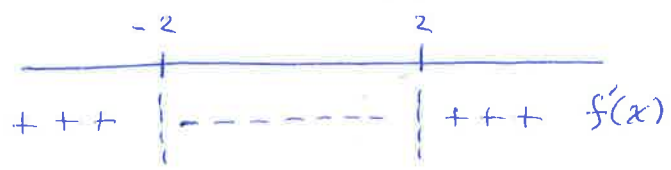**Instructions:** Show work and put a box around your final answer.

1. This problem concerns the function $f(x) = e^{x^3 - 12x}$.

(a) Find the critical points of $f(x)$.

$f'(x) = e^{x^3 - 12x}(3x^2 - 12) = e^{x^3 - 12x} \cdot 3(x^2 - 4) = 3(x-2)(x+2)e^{x^3 - 12x} = 0$

Critical points: $\boxed{x = 2 \qquad x = -2}$

(b) Find the intervals on which $f(x)$ increases, and those on which it decreases.

$+++ \quad | \quad ----- \quad | \quad +++ \quad f'(x)$

with -2 and 2 marked.

$\boxed{\begin{array}{l} \text{Increasing: } (-\infty, -2)(2, \infty) \\ \text{Decreasing: } (-2, 2) \end{array}}$

(c) Find the locations (x-coordinates) of the local maxima, if any. Find the locations of the local minima, if any.

By 1st Derivative Test:

$\boxed{\begin{array}{l} \text{Local max. at } x = -2 \\ \text{Local min. at } x = 2 \end{array}}$

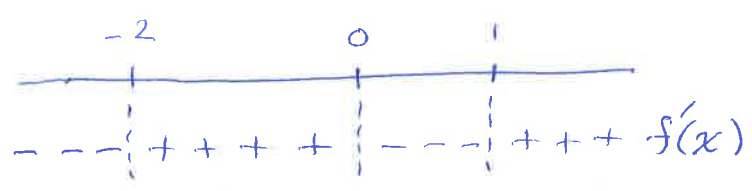1. This problem concerns the function $f(x) = 3x^4 + 4x^3 - 12x^2 + 2$.

(a) Find the critical points of $f(x)$.

$f'(x) = 12x^3 + 12x^2 - 24x = 12x(x^2 + x - 2) = 12x(x+2)(x-1) = 0$

Critical points: $\boxed{x = 0 \qquad x = -2 \qquad x = 1}$

(b) Find the intervals on which $f(x)$ increases, and those on which it decreases.

$--- | +++++ | --- | +++ \quad f'(x)$

with -2, 0, 1 marked.

$\boxed{\begin{array}{l} \text{Increasing: } (-2, 0)(1, \infty) \\ \text{Decreasing: } (-\infty, -2), (0, 1) \end{array}}$

(c) Find the locations (x-coordinates) of the local maxima, if any. Find the locations of the local minima, if any.

By 1st Derivative Test.

$\boxed{\begin{array}{l} \text{Local max. at } x = 0 \\ \text{Local min at } x = -2 \text{ and } 1 \end{array}}$

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MATH 200 – Quiz 8

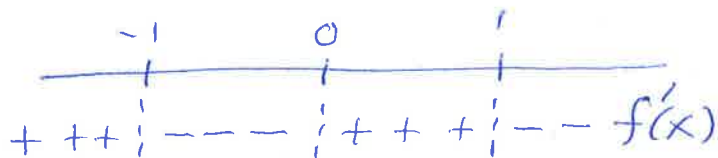**Instructions:** Show work and put a box around your final answer.

March 27, 2013

1. This problem concerns the function $f(x) = \frac{3}{2}x^4 - x^6$.

(a) Find the critical points of $f(x)$.

$$f'(x) = 6x^3 - 6x^5 = 6x^3(1-x^2) = 6x^3(1-x)(1+x) = 0$$

Critical points $\boxed{x=0 \qquad x=1 \qquad x=-1}$

(b) Find the intervals on which $f(x)$ increases, and those on which it decreases.

$$+++ \;|\; ---- \;|\; ++++ \;|\; --- \quad f'(x)$$
(number line at -1, 0, 1)

$\boxed{\begin{array}{l}\text{Increasing on } (-\infty,-1)(0,1)\\ \text{Decreasing on } (-1,0),(1,\infty)\end{array}}$

(c) Find the locations (x-coordinates) of the local maxima, if any. Find the locations of the local minima if any.

By 1st Derivative Test:

$\boxed{\begin{array}{l}\text{Local max at } x=-1 \text{ and } x=1\\ \text{Local min at } x=0\end{array}}$
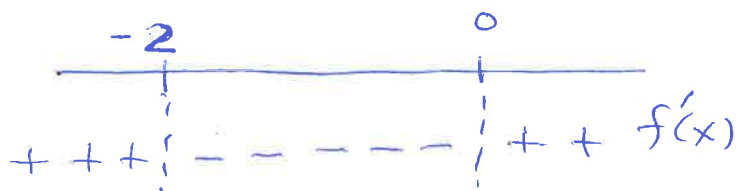
1. This problem concerns the function $f(x) = x^2 e^x$.

(a) Find the critical points of $f(x)$.

$$f'(x) = 2xe^x + x^2e^x = (2x+x^2)e^x = x(2+x)e^x = 0$$

Critical points. $\boxed{x=0 \qquad x=-2}$

(b) Find the intervals on which $f(x)$ increases, and those on which it decreases.

$$+++ \;|\; ------ \;|\; ++ \quad f'(x)$$
(number line at -2, 0)

$\boxed{\begin{array}{l}\text{Increasing on } (-\infty,-2),(0,\infty)\\ \text{Decreasing on } (-2,0)\end{array}}$

(c) Find the locations (x-coordinates) of the local maxima, if any. Find the locations of the local minima, if any.

By 1st Derivative Test:

$\boxed{\begin{array}{l}\text{Local max. at } x=-2\\ \text{Local min. at } x=0\end{array}}$