Math 171 – Quiz # 6 Name Key

For the function $f(x) = (6-x)\sqrt[3]{x}$ on the interval [-1, 8] — where $f'(x)=0$ or $f'(x)$ DNE

a) Find the critical values

$$f'(x) = (6-x)\tfrac{1}{3}\cdot x^{-2/3} + x^{1/3}(-1)$$

$$= \frac{6-x}{3x^{2/3}} - \frac{x^{1/3}}{1}\cdot\frac{3x^{2/3}}{3x^{2/3}} = \frac{6-x-3x}{3x^{2/3}} = \frac{6-4x}{3x^{2/3}} = \frac{2(3-2x)}{3x^{2/3}}$$

Critical values

$f'(x) = 0$ when $3-2x=0$; $x = 3/2$

$f'(x)$ DNE when $3x^{2/3}=0$; $x=0$

b) Find any absolute and local maxima and minima on the interval, if they exist

End pts:

$f(-1) = (6--1)\sqrt[3]{-1} = 7(-1) = -7$

$f(8) = (6-8)\sqrt[3]{8} = -2(2) = -4$

$f(3/2) = (6-3/2)\sqrt[3]{3/2} \approx (4.5)(1.14) \approx 5.15$

$f(0) = (6-0)\sqrt[3]{0} = 0$

$A_{max} = L_{max} = 4\tfrac{1}{2}\cdot\sqrt[3]{3/2} \approx 5.15$

$A_{min} = -7$

No L_{min}

Scoring
Baseline 4 pts
f'(x)-derivative function 2 pts,
Crit values 2 pts,
End pt values 2 pts,
Abs max/min 2 pts
Local max/min 2 pts.

Math 171 – Quiz # 7 Name Key

For $f(x) = x^3 - 6x^2 + 9x - 4$

1) Find the coordinates of any local maxima and minima

$f' = 3x^2 - 12x + 9$

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

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

when $x = 3, 1$

(crit. pts)

$f(3) = 3^3 - 6 \cdot 3^2 + 9 \cdot 3 - 4$

$= 27 - 54 + 27 - 4 = -4$

$(3, -4)$ ← Lmin

$f(1) = 1 - 6 + 9 - 4 = 0$

$(1, 0)$ ← Lmax

2) Find the coordinates of any inflection points

$f'' = 6x - 12$

$= 6(x-2) = 0$

when $x = 2$

$f(2) = 2^3 - 6 \cdot 2^2 + 9(2) - 4$

$= 8 - 24 + 18 - 4 = -2$

$(2, -2)$

Some helpful points! (chosen because they're further out than max/min)

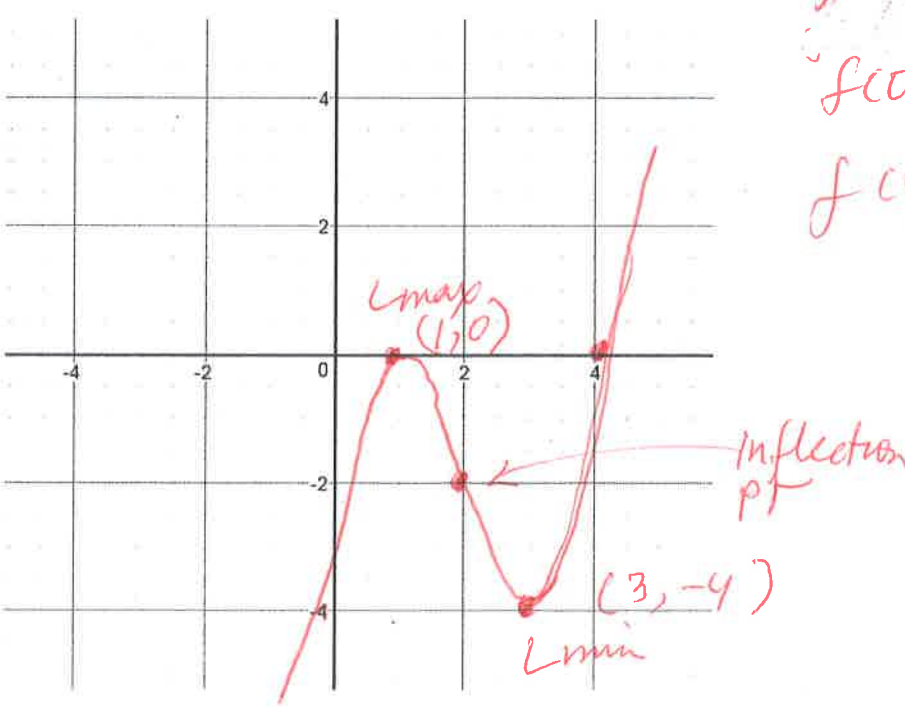
$f(0) = -4$ $(0, -4)$

$f(4) = 4^3 - 6 \cdot 16 + 9 \cdot 4 - 4$

$= 64 - 96 + 36 - 4$

$= 0$ $(4, 0)$

3) Sketch the graph of the original function, f(x)



4) List the interval(s) where the function is increasing

$(-\infty, 1)$ and $(3, \infty)$