Group Quiz 5
Calc I
Fall 2010

YOUR NAME: _____
GROUP MEMBER: _____
GROUP MEMBER: _____

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Problem 1: Without using a calculator, sketch the graph of

$$f(x) = (x^3 - 4x)^{1/3}.$$

Be sure to address the following questions:

2 (1) What's the domain of the function?
2 (2) Is the function even? odd? neither?
2 (3) Are there any x and y intercepts? What are they?
4 (4) Are there any vertical asymptotes? What happens as $x \to \pm\infty$?
4 (5) Are there any local mins and maxes? Where are they?
4 (6) Are there any inflection points? Where are they?

(1) all Real numbers

(2) $f(-x) = (-x^3 + 4x)^{1/3}$

$= \left((-1)(x^3 - 4x)\right)^{1/3}$

$= -(x^3 - 4x)^{1/3}$ odd

(3) y intercept: $(0, 0)$

x intercept $(x^3 - 4x) = 0 \iff x = 0, \pm 2.$

(4) no vertical asymptotes.

as $x \to +\infty$ $f(x) \to +\infty$

$x \to -\infty$ $f(x) \to -\infty$

(6) $f(x) = (x^3 - 4x)^{1/3}$

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

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

$\frac{27}{4}$ -

CV: $x = \pm\sqrt{\frac{4}{3}}, \pm 2, 0$

	$(\frac{4}{\sqrt{3}}, 0)$	$(0, \sqrt{\frac{4}{3}})$	$(\sqrt{\frac{4}{3}}, 2)$	$(2, \infty)$
f'	−	−	+	+

$f(-1)$: − − +

$+ \quad + \quad +$

$f''(x) = \left((3x^2-4)\left(-\frac{1}{3}(x^3-4x)^{-2/3}\right)\right) + (3x^2-4)\left(-\frac{2}{9}\right)(x^3-4x)^{-5/3}(3x^2-4)$

$= 6x\left(\frac{1}{3}(x^3-4x)^{-2/3}\right) + \frac{2(3x^2-4)^2}{9(x^3-4x)^{5/3}}$

$= \frac{2x}{(x^3-4x)^{2/3}} + \frac{2(3x^2-4)^2}{9(x^3-4x)^{5/3}}$

$= \frac{1}{(x^3-4x)^{5/3}}\left(\frac{2x}{(x^3-4x)^{-1}} - \frac{2(3x^2-4)^2}{9}\right)$

$= \frac{18x(x^3-4x) - 2(3x^2-4)^2}{9(x^3-4x)^{5/3}}$

$= \frac{-24x^2 - 32}{9(x^3-4x)^{5/3}}$

$18x^4 - 72x^2 - 2(9x^4 - 24x^2 + 16)$

$18x^4 - 72x^2 - 18x^4 + 48x^2 - 32$

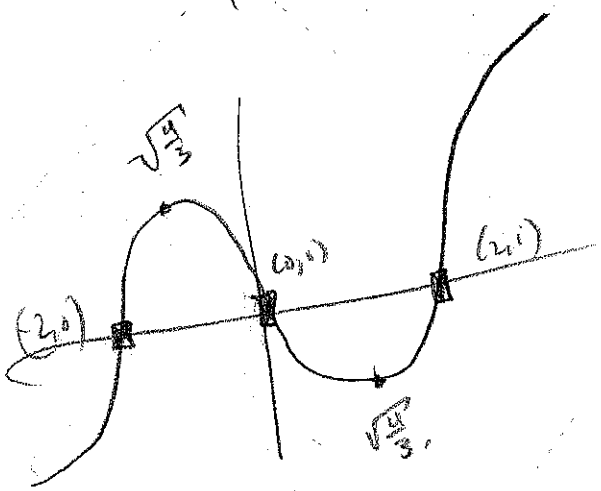
$-24x^2 - 32$

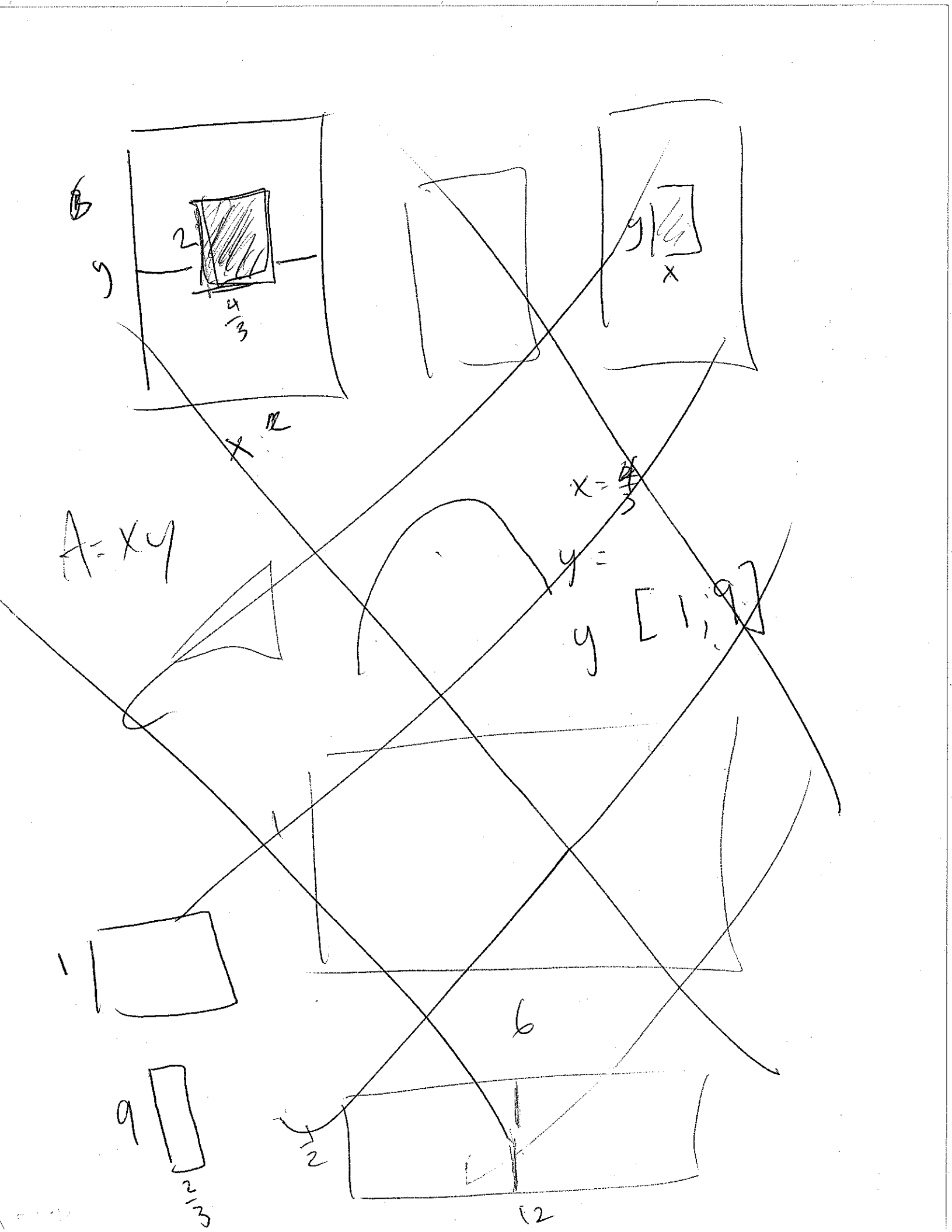
$-24x^2 - 32 = 0$ can never happen.

Possible IPs at $x = 0, \pm 2$ so

$f''(x)$

$(-\infty, -2)$	$(-2, 0)$	$(0, 2)$	$(2, \infty)$
$-$	$+$	$+$	$-$




B
2
y
4/3
x
12
y
x
x = 4/3
y =
y [1, 9]
A = xy
1
1
6
9
2/3
1/2
12