KFUPM
Math001
3 Dec 06

NAME:
ID:
Sec:

QUIZ # 4

1) a) Show that the equation $|x-1|+(y-3)^3=1$ defines a function.

$(y-3)^3 = 1 - |x-1|$

$y - 3 = \sqrt[3]{1-|x-1|} \Rightarrow y = 3 + \sqrt[3]{1-|x-1|}$

1 solution y only $\Rightarrow$ function

2) Let $f(x)=[\![2x-1]\!]+2$,

a) Evaluate $f(-3.7)$ $= [\![2(-3.7)-1]\!]+2 = [\![-7.4-1]\!]+2 = [\![-8.4]\!]+2$

$= -9+2 = -7$

b) Find the set of x such that $f(x)=0$

$[\![2x-1]\!]+2=0$

$[\![2x-1]\!]=-2$

$-2 \leq 2x-1 < -2+1$

$-2 \leq 2x-1 < -1$

$-1 \leq 2x < 0$

$\boxed{-\frac{1}{2} \leq x < 0}$

3) Find the domain of $f(x)=\dfrac{3}{\sqrt{x^2-1}}$

$x^2-1>0$

		-1		1	
$x+1$	$-$	0	$+$		$+$
$x-1$	$-$		$-$	0	$+$
x^2-1	$+$	0	$-$	0	$+$

Domain $= (-\infty,-1) \cup (1,\infty)$

4) A linear function has y-intercept at $(0,-2)$ and its x-intercept at $(-4,0)$. Find the equation of the function. (you can use the graph)

y-int is $(0,-2)$

Slope $= m = \dfrac{0-(-2)}{-4-0} = \dfrac{2}{-4} = -\frac{1}{2}$

$\Rightarrow \boxed{y=-\frac{1}{2}x-2}$

5) If 5 is the maximum of $f(x) = -x^2 + 2mx + 1$. Find the values of m.

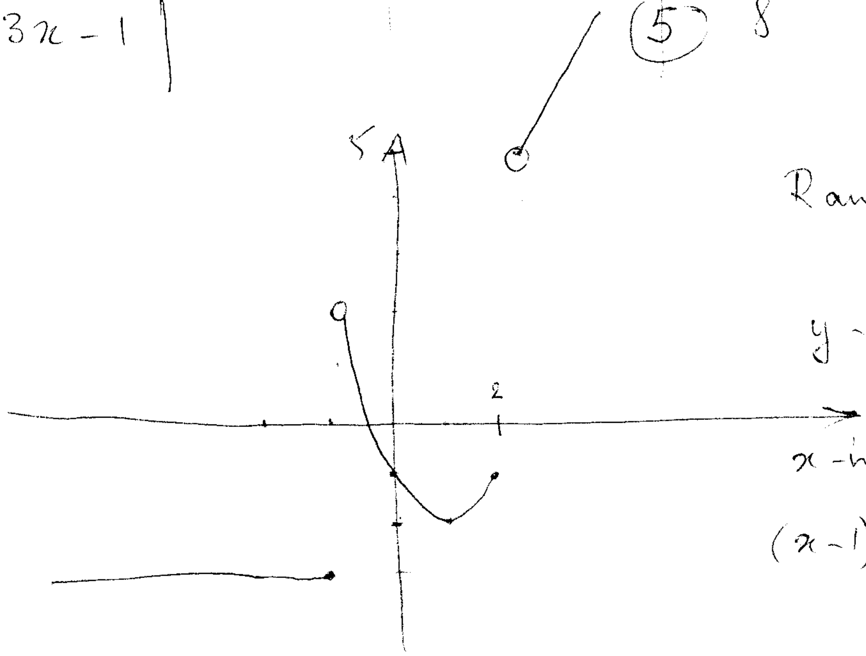
$$y = -x^2 + 2mx + 1$$
$$= -(x^2 - 2mx) + 1$$
$$= -(x^2 - 2mx + m^2) + 1 + m^2$$
$$= -(x - m)^2 + 1 + m^2$$

$k = 1 + m^2 = 5 \Rightarrow m^2 = 4 \Rightarrow m = \pm 2$

6) a) Draw the graph of $f(x) = \begin{cases} -3 & if \quad x \le -1 \\ (x-1)^2 - 2 & if \quad -1 < x \le 2 \\ 3x - 1 & if \quad 2 < x \end{cases}$

b) Find its range, x-intercepts and y-intercept

	-2	-1	1	2	3
-3	-3	-3			
$(x-1)^2 - 2$		2	-2	-1	
$3x - 1$				5	8



Range: $\{-3\} \cup [-1, 2) \cup (5, \infty)$

y-int $f(0) = (0-1)^2 - 2 = -1$

$(0, -1)$

x-int

$(x-1)^2 - 2 = 0 \Rightarrow (x-1)^2 = 2$

$x - 1 = \pm\sqrt{2}$

$x = 1 \pm \sqrt{2}$

$x = 1 - \sqrt{2} \in (-1, 2]$ ✓

$\boxed{(1-\sqrt{2}, 0)}$

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QUIZ # 4 c

1) a) Determine if the equation $|y-1|+(x-3)^3=1$ defines a function or not.

$|y-1| = 1-(x-3)^3$

$y-1 = \pm(1-(x-3)^3)$

$y = 1 \pm (1-(x-3)^3) \rightarrow 2$ sol^n $\Rightarrow$ not function

2) Let $f(x)=[\![3x-1]\!]+2$,

a) Evaluate $f(-3.4)$ $= [\![3(-3.4)-1]\!]+2 = [\![-10.2-1]\!]+2$

$= [\![-11.2]\!]+2 = -12+2 = \boxed{-10}$

b) Find the set of x such that $f(x)=1$

$[\![3x-1]\!]+2 = 1$

$[\![3x-1]\!] = -1$

$-1 \leq 3x-1 < 0$

$0 \leq 3x < 1$

$\boxed{0 \leq x < \frac{1}{3}}$

3) Find the domain of $f(x)=\sqrt{\dfrac{x+3}{x-1}}$

$\dfrac{x+3}{x-1} \geq 0$ & $x-1 \neq 0$

$D = (-\infty,-3] \cup (1,\infty)$

x		-3		1	
$x+3$	$-$	0	$+$		$+$
$x-1$	$-$		$-$	0	$+$
	$+$	0	$-$	U	$+$

4) A line L passes through $(0,-2)$ and its perpendicular to line L_2 with equation $2x-4y-1=0$. Find the equation of the function. (you can use the graph)

$m_2 = ?$ $4y = 2x-1 \Rightarrow y = \frac{2}{4}x - \frac{1}{4} = \frac{x}{2} - \frac{1}{4}$

$\Rightarrow m_2 = \frac{1}{2} \Rightarrow m = -\frac{1}{m_2} = -2$

y-int $(0,-2)$

$\Rightarrow \boxed{y = -2x - 2}$

$\Rightarrow$

5) If the minimum of $f(x) = -x^2 + 2mx + 1$ is reached at $x = 2$. What is the minimum value of the function

The minimum is reached at $x = h = 2$

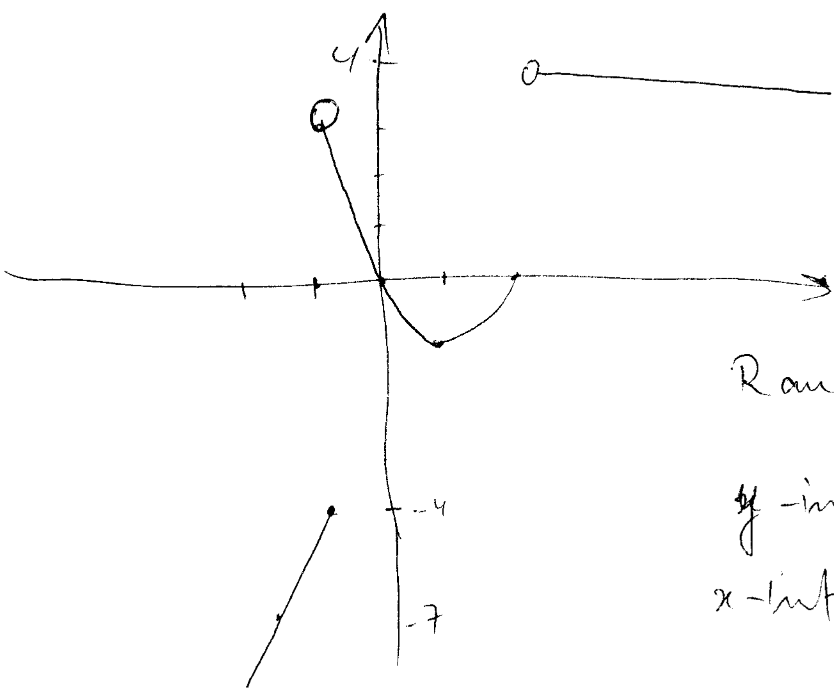
$h = -\frac{b}{2a} = -\frac{2m}{-2} = m = 2$

minimum is $k = f(h) = -(2)^2 + 2(2)(2) + 1 = -4 + 8 + 1 = 5$

6) a) Draw the graph of $f(x) = \begin{cases} 3x-1 & if \quad x \le -1 \\ (x-1)^2 - 1 & if \quad -1 < x \le 2 \\ 4 & if \quad 2 < x \end{cases}$

b) Find its range, x-intercepts and y-intercept

	-2	-1	1	2	3
$3x-1$	-7	-4			
$(x-1)^2 - 1$		3	-1	0	
4				4	4



Range: $(-\infty, -4] \cup [-1, 3) \cup \{4\}$

y-int $(0, 0)$

x-int $(0, 0)$, $(2, 0)$