

MATH 1318 A-MIDTERM # 1- Fall 2015

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Last Name: _____ First Name: _____

ID# _____

Key

Instructions: This midterm exam consists of 5 multiple choice questions and 4 long answer questions. The multiple choice questions are worth 1 point each, and the long answer questions are as indicated. The total value of the exam is 35 points.

Place your answers to the multiple choice questions in the boxes below. All your work on the long answer questions must be clearly marked. You may use the backs of pages.

For long answer questions, YOU MUST SHOW YOUR WORK.

ONLY BASIC CALCULATORS ARE ALLOWED.

If you need additional scrap paper, it will be provided by the proctors.

Multiple Choice Answers:

Question	1	2	3	4	5
Answer					

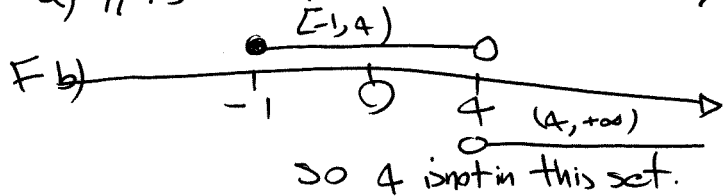
Multiple Choice Section Questions (1-5)

Question 1 Which one of the following is true.

- (a) $\pi \in \mathbb{Q}$ F
 (b) $[-1, 4) \cup (4, +\infty) = [-1, +\infty)$ F
 (c) $\mathbb{R} \cap \mathbb{Q} = \mathbb{Q}$ T
 (d) $(-1, 1) \subset [-1, 1]$ T

- (A) a and b
 (B) b and c
 (C) c and d ✓
 (D) only d

a) π is an irrational number so $\pi \notin \mathbb{Q}$



c) every rational number is a real number so intersection of real numbers & rational numbers is \mathbb{Q} .

d) every number in $(-1, 1)$ is also in $[-1, 1]$, so

$$(-1, 1) \subset [-1, 1]$$

Question 2 Which one of the following is the solution to the inequality

$$\left| \frac{3-2x}{2} \right| < 5$$

- (A) $-\frac{13}{2} < x < \frac{7}{2}$
 (B) $-\frac{13}{2} < x < -\frac{7}{2}$
 (C) $x > \frac{7}{2}$ or $x < -\frac{13}{2}$
 (D) $-\frac{7}{2} < x < \frac{13}{2}$ ✓

$$-5 < \frac{3-2x}{2} < 5$$

$$-10 < 3-2x < 10$$

$$-13 < -2x < 7$$

$$\frac{13}{2} > x > -\frac{7}{2}$$

means $-\frac{7}{2} < x < \frac{13}{2}$

Question 3 Which one of the following expresses the coordinates of the midpoint, and the distance between the points $A(-3, \frac{1}{2})$ and $B(3, \frac{3}{2})$? The midpoint is denoted by M and distance is denoted by $d(A, B)$.

(A) $M(-9/2, -1/2)$ and $d(A, B) = 6$

(B) $M(0, 1)$ and $d(A, B) = 6$

(C) $M(-9/2, -1/2)$ and $d(A, B) = \sqrt{37}$

(D) $M(0, 1)$ and $d(A, B) = \sqrt{37}$

$$M: \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

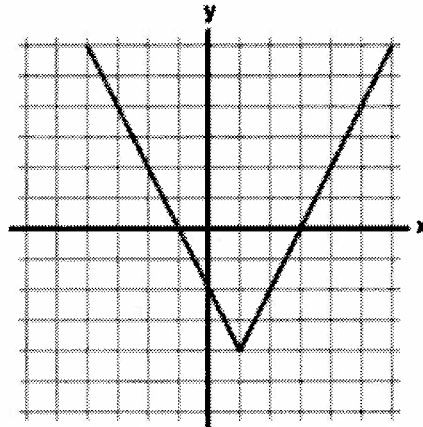
$$\left(\frac{-3 + 3}{2}, \frac{\frac{1}{2} + \frac{3}{2}}{2} \right) = \left(0, \frac{4}{2} \right) = (0, 1)$$

$$d(A, B) = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$$

$$= \sqrt{\left(\frac{3}{2} - \frac{1}{2}\right)^2 + (3 - (-3))^2} = \sqrt{\left(\frac{2}{2}\right)^2 + (6)^2}$$

$$= \sqrt{(1)^2 + 36} = \sqrt{37}$$

Question 4 The graph below is the graph for which of the following functions?



(A) $|x - 1| - 4$

(B) $|x + 1| - 4$

(C) $2|x - 1| - 4$

~~(D) $2|x + 1| - 4$~~

this is the graph of $2|x|$ shifted horizontally to the right for 1 unit, that is $2|x - 1|$ and shifted downward 4 units, that is

$2|x - 1| - 4$

Question 5 Suppose $f(x) = \frac{x-3}{x+3}$ and $g(x) = \frac{\sqrt{x+9}}{10}$. A point is on the intersection of the graphs of f and g , if it is on the both graphs of f and g . Which of the following points is on the intersection of the graph of f and g ?

- (A) $(0, -1)$
- ✓ (B) $(7, 2/5)$
- (C) $(0, 3/10)$
- (D) none of the above

$f(0) = -1$ so $(0, -1)$ is on the graph $\checkmark f(x)$
 $g(0) = \frac{3}{10}$, so $(0, -1)$ is not on the graph $\checkmark g(x)$.

$f(7) = \frac{7-3}{7+3} = \frac{4}{10} = \frac{2}{5}$ so $(7, \frac{2}{5})$ is on $f(x)$

$g(7) = \frac{\sqrt{7+9}}{10} = \frac{\sqrt{16}}{10} = \frac{4}{10} = \frac{2}{5}$, so it is also on $g(x)$.

Question 6 (6 points) Simplify the following expressions.

$$a) \sqrt{\frac{4u^3v}{w^5}} = \sqrt{\frac{4u^3u^{-1}}{v^5v^{-1}}} = \sqrt{\frac{4u^2}{v^4}}$$

$$= \frac{\sqrt{4} \sqrt{u^2}}{\sqrt{v^4}} = \frac{2|u|}{|v^2|} = \frac{2|u|}{(v^2)}$$

$$b) \frac{x^{-2} - y^{-2}}{x^{-1} + y^{-1}}$$

$$= \frac{\frac{1}{x^2} - \frac{1}{y^2}}{\frac{1}{x} + \frac{1}{y}} = \frac{\left(\frac{1}{x}\right)^2 - \left(\frac{1}{y}\right)^2}{\left(\frac{1}{x}\right) + \left(\frac{1}{y}\right)} = \text{by special factoring formula}$$

$$= \frac{\left(\frac{1}{x} - \frac{1}{y}\right) \left(\frac{1}{x} + \frac{1}{y}\right)}{\left(\frac{1}{x} + \frac{1}{y}\right)} = \frac{1}{x} - \frac{1}{y} = x^{-1} - y^{-1}$$

Question 7 (8 points) Solve the following inequalities. Write your answer in terms of intervals, and graph your answer on the number line.

a) $x^2 \geq -x + 12$

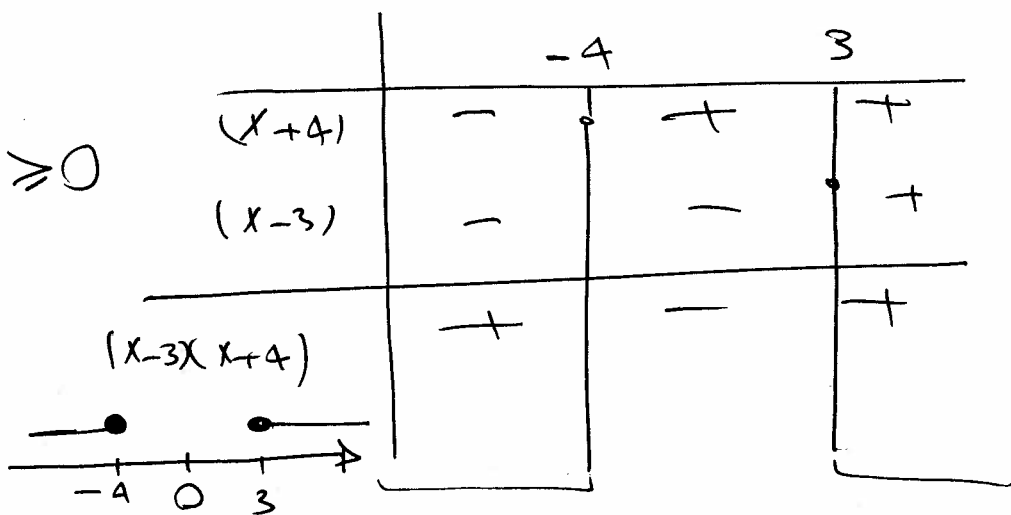
$$x^2 + x - 12 \geq 0$$

$$(x - 3)(x + 4) \geq 0$$

$$x - 3 = 0 \Rightarrow x = 3$$

$$x + 4 = 0 \Rightarrow x = -4$$

$$(-\infty, -4] \cup [3, +\infty)$$



b) $\frac{2x+1}{x-4} \leq 3$

$$\frac{2x+1}{x-4} - 3 \leq 0$$

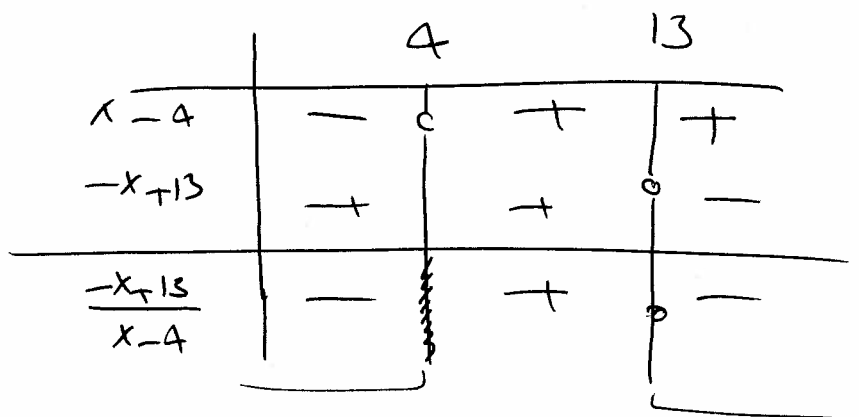
$$\frac{2x+1-3(x-4)}{x-4} \leq 0$$

$$\frac{2x+1-3x+12}{x-4} \leq 0$$

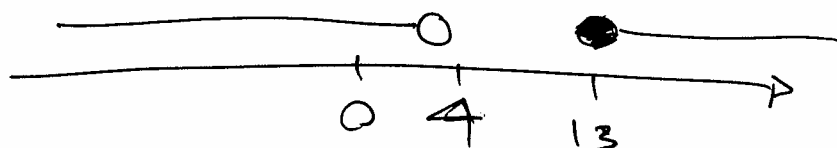
$$\frac{-x+13}{x-4} \leq 0$$

$$-x+13=0 \Rightarrow x=13$$

$$x-4=0 \Rightarrow x=4$$



$$(-\infty, 4) \cup [13, +\infty)$$



Question 8 (10 points) Find the domain of the following functions. Write your answer in interval notation.

a) $\frac{\sqrt{-x+2}}{-3-x}$

$$D: \{x \mid x \leq 2 \text{ and } x \neq -3\}$$

$$-3-x=0 \Rightarrow x = -3$$

$$(-\infty, -3) \cup (-3, 2]$$

$$-x+2 \geq 0 \Rightarrow x \leq 2$$

b) $\sqrt{|x|+3}$

$|x|+3 \geq 0$, this is always true because $|x| \geq 0$ so

$$D: \mathbb{R} \quad (-\infty, +\infty)$$

$$|x|+3 \geq 3 \geq 0$$

c) $\frac{x-1}{(x+5)(x-\sqrt{3})}$

$$x+5=0 \Rightarrow x = -5$$

$$D: \{x \mid x \neq -5, x \neq \sqrt{3}\}$$

$$x-\sqrt{3}=0 \Rightarrow x = \sqrt{3}$$

$$(-\infty, -5) \cup (-5, \sqrt{3}) \cup (\sqrt{3}, +\infty)$$

Question 9 (6 points) Graph the function $f(x) = 1 + -\sqrt{x-2}$.

