MA109 — College Algebra Spring 2016
Exam 1 2016-02-10

Name: Solutions Sec.: _____

Do not remove this answer page — you will turn in the entire exam. You have two hours to do this exam. No books or notes may be used. You may use an ACT-approved calculator during the exam, but NO calculator with a Computer Algebra System (CAS), networking, or camera is permitted. Absolutely no cell phone use during the exam is allowed.

The exam consists of multiple choice questions. Record your answers on this page. For each multiple choice question, you will need to fill in the circle corresponding to the correct answer. For example, if (a) is correct, you must write

(a) (b) (c) (d) (e)

Do not circle answers on this page, but please circle the letter of each correct response in the body of the exam. It is your responsibility to make it CLEAR which response has been chosen. You will not get credit unless the correct answer has been marked on both this page and in the body of the exam.

GOOD LUCK!

1.	a	**b**	c	d	e	11.	a	**b**	c	d	e
2.	a	b	**c**	d	e	12.	**a**	b	c	d	e
3.	**a**	b	c	d	e	13.	a	b	c	**d**	e
4.	**a**	b	c	d	e	14.	a	b	c	d	**e**
5.	a	b	c	**d**	e	15.	a	b	c	**d**	e
6.	**a**	b	c	d	e	16.	a	b	**c**	d	e
7.	a	b	c	d	**e**	17.	a	**b**	c	d	e
8.	a	b	c	d	**e**	18.	a	b	**c**	d	e
9.	a	b	c	**d**	e	19.	a	**b**	c	d	e
10.	a	b	c	d	**e**	20.	a	b	**c**	d	e

For grading use:

Number Correct	
	(out of 20 problems)

Total	
	(out of 100 points)

Name: _____

Multiple Choice Questions

Show all your work on the page where the question appears.
Clearly mark your answer both on the cover page on this exam
and in the corresponding questions that follow.

1. Simplify the expression. $16 - 4 \cdot 6^2$

Possibilities:

(a) 160

(b) -128

(c) 5184

(d) -560

(e) -32

$16 - 4 \cdot 36 = 16 - 144 = -128$

2. Simplify the expression without using a calculator. Your answer should not have any radicals in it.

$$\sqrt{50}\sqrt{18}$$

Possibilities:

(a) 15

(b) 60

(c) 30

(d) 900

(e) 68

$\sqrt{50}\sqrt{18} = \sqrt{25 \cdot 2}\sqrt{2 \cdot 9}$

$= \sqrt{25}\sqrt{2}\sqrt{2}\sqrt{9}$ (use the property $\sqrt{ab} = \sqrt{a}\sqrt{b}$)

$= \sqrt{25}\sqrt{4}\sqrt{9}$

$= 5 \cdot 2 \cdot 3 = 30$

3. What is the first operation applied to x in the following expression? $8 - (x+3)^5$

Possibilities:

(a) Add 3

(b) Take the 5th root

(c) Raise it to the 5th power

(d) Multiply by -1

(e) Subtract it from 8

Order of operations as they are applied to x

1.) Add 3 to x

2.) Raise to the 5th power

3.) Multiply by -1

4.) Add it to 8

4. Simplify, and write the given number without using absolute values. $5 - |2 - 8|$

Possibilities:

(a) -1

(b) 1

(c) 15

(d) -5

(e) 11

$5 - |2-8| = 5 - |-6| = 5 - 6 = \boxed{-1}$

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5. Simplify the given number: $4 - |-9|$

Possibilities:

(a) 13

(b) -13

(c) 0

(d) -5

(e) 5

$= 4 - 9 = \boxed{-5}$

★Remember the absolute value make the number inside positive but do not directly affect any numbers outside them.

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6. Simplify, and write the given number without using absolute values. $|\sqrt{3} - 6|$

Possibilities:

(a) $6 - \sqrt{3}$

(b) 33

(c) $\sqrt{3} - 6$

(d) $-6 - \sqrt{3}$

(e) $6 + \sqrt{3}$

$\sqrt{3} < 6$ (Why? Reason 1: put $\sqrt{3}$ into your calc to get $\sqrt{3} \approx 1.732$

Reason 2: $6 = \sqrt{36}$. $36 > 3$ so $\sqrt{36} > \sqrt{3}$

$6 > \sqrt{3}$)

$\Rightarrow$ Since $\sqrt{3} < 6$, $\sqrt{3} - 6$ is negative so $|\sqrt{3} - 6| = -(\sqrt{3} - 6)$

$= \boxed{6 - \sqrt{3}}$

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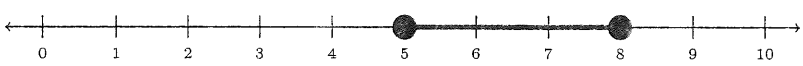
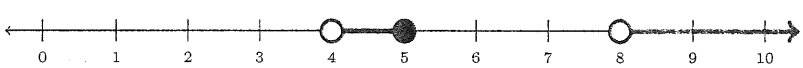
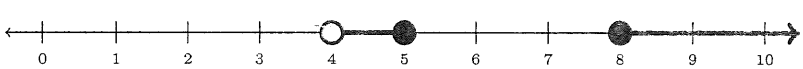
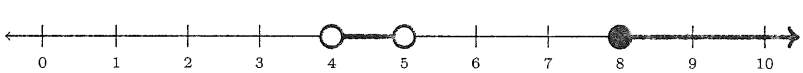
7. Which of the following number lines represents the union of intervals $[4, 5] \cup [8, \infty)$

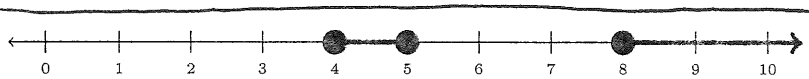
Possibilities:

(a) 

(b) 

(c) 

(d) 

(e) 

Closed brackets [,] correspond to closed dots •

Parenthesis (,) correspond to open dots o

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8. Solve for s in $2(9 - \sqrt{s}) = 16$.

Possibilities:

(a) $s = -7$

(b) No solution

(c) $s = \frac{13}{2}$

(d) $s = 10$

(e) $s = 1$

divide both sides by 2

$2(9-\sqrt{s}) = 16 \Rightarrow 9 - \sqrt{s} = 8$

$-9 \quad -9$

$\Rightarrow -\sqrt{s} = -1$

$\Rightarrow \sqrt{s} = 1$

$\Rightarrow s = 1^2 = 1$

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9. Find the y-intercept(s) of the graph of $y - 16 = x^2 - 9x - 2$.

Possibilities:

(a) $(2, 0)$ only

(b) $(7, 14)$ and $(2, 14)$

(c) $(7, 0)$ and $(2, 0)$

(d) $(0, 14)$ only

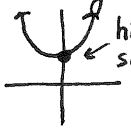
(e) $(7, 0)$ only

$\Rightarrow y = x^2 - 9x + 14$ (add 16 to both sides)

$\Rightarrow y = 0^2 - 9(0) + 14$ (plug in 0 for x)

$\Rightarrow y = 14$

☆ The y-intercept is where the function crosses the x-axis



hits y-axis so $x=0$

so plug in $x=0$ into the equation

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10. Solve for x in $5 + |7 - x| = 9$.

Possibilities:

(a) 7 and 3

(b) 7 only

(c) 3 only

(d) 11 only

(e) 3 and 11

$\Rightarrow |7-x| = 4$ (subtract 5 from both sides)

$\Rightarrow$ either $7-x=4$ or $7-x=-4$

$\Rightarrow$ either $7-4=x$ or $7+4=x$ ($7-x=4 \Rightarrow 7-x-4=0 \Rightarrow 7-4=x$)

$\Rightarrow$ either $3=x$ or $11=x$

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11. The point $(8, 3)$ is on the graph of which of the following equations?

Possibilities:

(a) $4x + 24 = 4y + 24$

(b) $4x + 24 = xy + 32$

(c) $x = y - 5$

(d) $xy = 0$

(e) $xy + 32 = xy + 12$

Can't be (d) $(8 \cdot 3 \neq 0)$

Can't be (c) $(8 \neq 3-5)$

Can't be (e) $(8 \cdot 3 + 32 \neq 8 \cdot 3 + 12)$

Can't be (a) $(\underbrace{4 \cdot 8 + 24}_{56} \neq \underbrace{4 \cdot 3 + 24}_{36})$

The answer is (b) because $\underbrace{4 \cdot 8 + 24}_{32+24=56} = \underbrace{8 \cdot 3 + 32}_{24+32=56}$

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12. The graph of $x^2 + y^2 - 16x - 6y + 48 = 0$ is a circle. Find its center and its radius.

Possibilities:

(a) Radius: 5 Center: $(8, 3)$

(b) Radius: $4\sqrt{3}$ Center: $(-8, -3)$

(c) Radius: 10 Center: $(16, 6)$

(d) Radius: $4\sqrt{3}$ Center: $(8, 3)$

(e) Radius: 5 Center: $(-8, -3)$

complete the square twice

$x^2 - 16x + y^2 - 6y + 48 = 0$

$\Rightarrow (x^2 - 16x + 64) - 64 + (y^2 - 6y + 9) - 9 + 48 = 0$

$\Rightarrow (x-8)^2 - 64 + (y-3)^2 - 9 + 48 = 0$

$\Rightarrow (x-8)^2 + (y-3)^2 - 25 = 0$

$\Rightarrow (x-8)^2 + (y-3)^2 = 25$

$\Rightarrow (x-8)^2 + (y-3)^2 = 5^2$

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13. Find an equation for the circle shown below:

Possibilities:

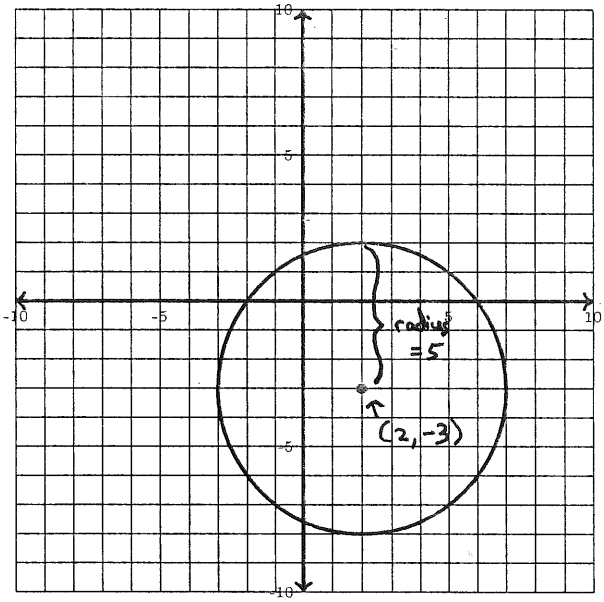
(a) $(x-2)^2+(y-3)^2=5$

(b) $(x+2)^2+(y-3)^2=25$

(c) $(x-4)^2+(y-6)^2=-25$

(d) $(x-2)^2+(y+3)^2=25$

(e) $(x+2)^2+(y+3)^2=5$



radius: 5

center: $(2,-3)$

equation: $(x-2)^2+(y-(-3))^2=5^2$

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14. Find all distinct, real solutions x to $\sqrt{11-x}=x-5$

Possibilities:

(a) 2 only

(b) 2 and 7

(c) 11 only

(d) 11 and -5

(e) 7 only

$\Rightarrow 11-x=(x-5)^2$ (square both sides)

$\Rightarrow 11-x=x^2-10x+25$

$\Rightarrow 0=x^2-9x+14$ (add x and subtract 11 from both sides)

$\Rightarrow x=\frac{9\pm\sqrt{81-4(1)(14)}}{2(1)}$ (quadratic formula with $a=1, b=-9, c=14$)

$\Rightarrow x=\frac{9\pm\sqrt{25}}{2}$ $(81-56=25)$

$\Rightarrow x=\frac{9\pm5}{2}=\frac{9+5}{2}$ or $\frac{9-5}{2}=7$ or 2

Check answers!

$x=7$: $\sqrt{11-7}=7-5$?

$\sqrt{4}=2$? Yes!

$x=2$: $\sqrt{11-2}=2-5$?

$\sqrt{9}=-3$? No!

$x=7$ is the only solution

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15. Find an equation for the line through the points $(6, 7)$ and $(9, 8)$.

Possibilities:

(a) $y - 7 = 3(x - 6)$

(b) $y + 7 = 3(x + 6)$

(c) $y = -3(x - 6) - 7$

(d) $y - 7 = \frac{1}{3}(x - 6)$

(e) $y + 7 = \frac{1}{3}(x + 6)$

slope $= \frac{8-7}{9-6} = \frac{1}{3}$

point: $(6,7) = (x_0, y_0)$

point-slope formula: $y - y_0 = m(x - x_0)$

$\Rightarrow y - 7 = \frac{1}{3}(x-6)$

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16. Rewrite the expression $x^2 - 8x + 3$ by completing the square.

Possibilities:

(a) $(x + 4)^2 + 13$

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

(c) $(x - 4)^2 - 13$

(d) $(x + 8)^2 - 3$

(e) $(x - 8)^2 + 3$

$x^2 - 8x + 16 - 16 + 3$ $\left(\left(\frac{-8}{2}\right)^2 = (-4)^2 = 16\right)$

$= (x-4)^2 + -13$

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17. Find all distinct, real solutions x to $(x^2 - 7)(x - 2)(x - 4) = 0$.

Possibilities:

(a) $x = 7$, $x = 2$, and $x = 4$

(b) $x = \pm\sqrt{7}$, $x = 2$, and $x = 4$

(c) $x = -7$, $x = -2$, and $x = -4$

(d) $x = \pm\sqrt{7}$, $x = -2$, and $x = -4$

(e) No solution

$\Rightarrow x^2 - 7 = 0$ or $x - 2 = 0$ or $x - 4 = 0$

$\Rightarrow x^2 = 7$ or $x = 2$ or $x = 4$

$x = \pm\sqrt{7}$

*Here we used the zero product property:
If $AB = 0$ then either $A = 0$ or $B = 0$.
With three factors it is this:
If $ABC = 0$ then either $A = 0$, $B = 0$, or $C = 0$.
Here $A = (x^2 - 7)$, $B = (x - 2)$, and $C = (x - 4)$.

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18. Find the slope of the line in the graph.

Possibilities:

(a) 3

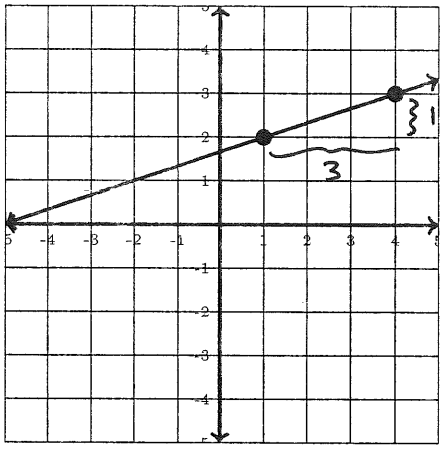
(b) -3

(c) $\frac{1}{3}$

(d) $-\frac{1}{3}$

(e) The slope is not defined.

slope $= \frac{\text{rise}}{\text{run}} = \frac{1}{3}$



19. Find all distinct, real solutions x to $x^{14} - 9x^7 + 18 = 0$

Possibilities:

(a) $x = 3$ only

(b) $x = \sqrt[7]{3}$ and $x = \sqrt[7]{6}$

(c) $x = 3^7$ and $x = 6^7$

(d) $x = 6$ only

(e) $x = 3$ and $x = 6$

substitute $u = x^7$ (notice $x^{14} = (x^7)^2 = u^2$)

$x^{14} - 9x^7 + 18 = 0$

$\Rightarrow u^2 - 9u + 18 = 0$

$\Rightarrow (u-3)(u-6) = 0$

$\Rightarrow u = 3$ or $u = 6$

$\Rightarrow x^7 = 3$ or $x^7 = 6$

$\Rightarrow \boxed{x = \sqrt[7]{3} \text{ or } x = \sqrt[7]{6}}$

20. What is the distance between $(-7, -2)$ and $(4, -5)$?

x_1, y_1 $\quad$ x_2, y_2

Possibilities:

(a) $\sqrt{106}$

(b) $\sqrt{58}$

(c) $\sqrt{130}$

(d) 3

(e) $\sqrt{14}$

(f) 11

distance $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(4 - (-7))^2 + (-5 - (-2))^2}$

$= \sqrt{(11)^2 + (-3)^2}$

$= \sqrt{121 + 9} = \boxed{\sqrt{130}}$