

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 a graphing calculator during the exam, but NO calculator with a Computer Algebra System (CAS) or a QWERTY keyboard is permitted. Absolutely no cell phone use during the exam is allowed.

The exam consists of 15 multiple choice questions and 5 short answer questions. Record your answers on this page. For the multiple choice questions, you will need to fill in the box corresponding to the correct answer. For example, if (b) is correct, you must write

a  b  c  d  e

Do not circle answers on this page, but please do 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. <input checked="" type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e  | 11. <input type="checkbox"/> a <input type="checkbox"/> b <input checked="" type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e |
| 2. <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input checked="" type="checkbox"/> e  | 12. <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input checked="" type="checkbox"/> e |
| 3. <input type="checkbox"/> a <input type="checkbox"/> b <input checked="" type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e  | 13. <input type="checkbox"/> a <input checked="" type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e |
| 4. <input type="checkbox"/> a <input checked="" type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e  | 14. <input type="checkbox"/> a <input checked="" type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e |
| 5. <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input checked="" type="checkbox"/> d <input type="checkbox"/> e  | 15. <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input checked="" type="checkbox"/> e |
| 6. <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input checked="" type="checkbox"/> d <input type="checkbox"/> e  | 16. $x_1 = 4, x_2 = -3$   |
| 7. <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input checked="" type="checkbox"/> d <input type="checkbox"/> e  | 17. $x_1 = 3, x_2 = -9$   |
| 8. <input checked="" type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e  | 18. $(x-3)^2 + (y+1)^2 = 4$   |
| 9. <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input checked="" type="checkbox"/> e  | 19. $y-5 = 4(x+3)$  |
| 10. <input type="checkbox"/> a <input type="checkbox"/> b <input checked="" type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e | 20. $(6, -2)$   |

For grading use:

Total	
	(out of 100 pts)

Please make sure to list the correct section number on the front page of your exam and on this page.

Section #	Instructor	Lectures
018	Boucher	TR 2:00pm-3:15pm, CB 347
020	Boucher	TR 3:30pm-4:45pm, CB 339
004	Butcher	MWF 11:00am-11:50am, CB 337
009	Butcher	MWF 3:00pm-3:50pm, CB 337
016	Kilty	TR 12:30pm-1:45pm, CB 341
012	Kirby	TR 9:30am-10:45am, CB 347
015	Kirby	TR 12:30pm-1:45pm, CB 335
003	Li	MWF 11:00am-11:50am, CB 335
005	Li	MWF 12:00pm-12:50pm, CB 217
401	Mattingly	TR 6:00pm-7:15pm, CB 349
402	Mattingly	TR 7:30pm-8:45pm, CB 349
008	Nicolas	MWF 3:00pm-3:50pm, CB 335
017	Robinson	TR 2:00pm-3:15pm, CB 341
019	Robinson	TR 3:30pm-4:45pm, CB 335
001	Steil	MWF 9:00am-9:50am, CB 306
002	Steil	MWF 10:00am-10:50am, CB 337
006	Weaver	MWF 1:00pm-1:50pm, CB 335
007	Weaver	MWF 2:00pm-2:50pm, CB 337
010	Zeckner	TR 8:00am-9:15am, CB 335
013	Zeckner	TR 11:00am-12:15pm, CB 347

### 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. Solve the equation.

$$2x^2 - 3x - 5 = 0$$

$$a = 2 \quad b = -3 \quad c = -5$$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-5)}}{2 \cdot 2}$$

$$= \frac{3 \pm \sqrt{49}}{4} = \frac{3 \pm 7}{4} = \frac{10}{4}, \frac{-4}{4}$$
$$= \frac{5}{2}, -1$$

Possibilities:

(a)  $x_1 = -1, x_2 = \frac{5}{2}$

(b)  $x_1 = -3, x_2 = \frac{1}{2}$

(c)  $x_1 = 3, x_2 = -\frac{1}{2}$

(d)  $x_1 = 1, x_2 = -\frac{5}{2}$

(e) No Solutions

2. A ball is thrown straight upward at an initial speed of  $v_0 = 200$  ft/sec. From Physics, it is known that the height,  $h$ , of the ball after  $t$  seconds is given by the formula

$$h = -16t^2 + 200t.$$

When is the height of the ball 500 ft?

$$500 = -16t^2 + 200t$$

$$0 = -16t^2 + 200t - 500$$

Use quadratic formula

with  $a = -16, b = 200,$

$$c = -500$$

$$t \approx 3.45, 9.05$$

Possibilities:

(a) About  $t_1 = .52$  seconds and about  $t_2 = 11.98$  seconds.

(b) About  $t_1 = 1.25$  seconds and about  $t_2 = 11.25$  seconds.

(c) About  $t_1 = 1.74$  seconds and about  $t_2 = 10.76$  seconds.

(d) About  $t_1 = 2.71$  seconds and about  $t_2 = 9.78$  seconds.

(e) About  $t_1 = 3.45$  seconds and about  $t_2 = 9.05$  seconds.

3. Find all real solutions of the equation

$$x + \sqrt{x} - 6 = 0$$

Possibilities:

- (a)  $x = 2$
- (b)  $x = 3$
- (c)  $x = 4$
- (d)  $x = 9$
- (e)  $x = 16$

$$u = \sqrt{x}$$

$$u^2 = x$$

$$u^2 + u - 6 = 0$$

$$(u+3)(u-2) = 0$$

$$u = -3 \quad u = 2$$

$$u = -3$$

~~$$\sqrt{x} = -3$$~~

Never

$$u = 2$$

$$\sqrt{x} = 2$$

$$x = 4$$

4. Solve the linear inequality. Express the solution using interval notation.

$$2x + 3 \geq 5x + 12$$

Possibilities:

- (a)  $[-3, \infty)$
- (b)  $(-\infty, -3]$
- (c)  $[3, \infty)$
- (d)  $(-\infty, 3]$
- (e)  $[-3, 3]$

$$-3x \geq 9 \quad \text{sign change}$$

$$\frac{-3x}{-3} \leq \frac{9}{-3}$$

$$x \leq -3$$



$$(-\infty, -3]$$

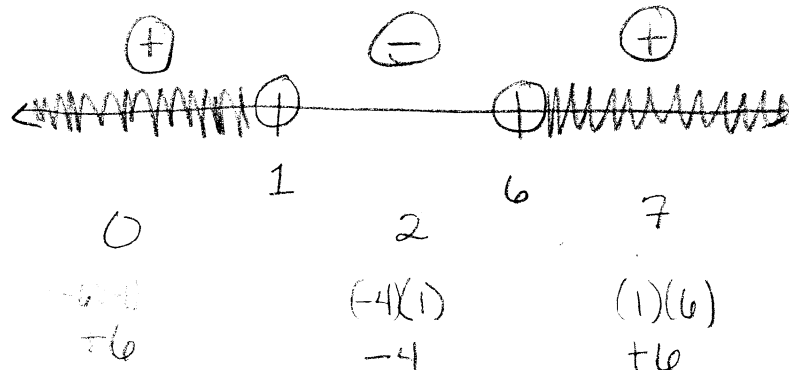
5. Solve the nonlinear inequality. Express the solution using interval notation.

$$x^2 - 7x + 6 > 0 \quad \leftarrow \text{want } (+)$$

$$(x-6)(x-1) > 0$$

Possibilities:

- (a)  $(-\infty, -1) \cup (6, \infty)$
- (b)  $(-\infty, -6) \cup (-1, \infty)$
- (c)  $(-6, -1)$
- (d)  $(-\infty, 1) \cup (6, \infty)$
- (e)  $(1, 6)$



$$(-\infty, 1) \cup (6, \infty)$$

6. Solve the inequality. Express the solution using interval notation.

$$|2x - 3| \leq 5$$

$$\begin{array}{ccc} -5 & \leq & 2x - 3 \leq 5 \\ +3 & & +3 \quad +3 \end{array}$$

$$\frac{-2}{2} \leq \frac{2x}{2} \leq \frac{8}{2}$$

$$-1 \leq x \leq 4$$

$$[-1, 4]$$

Possibilities:

- (a)  $(-\infty, 1] \cup [4, \infty)$
- (b)  $[-4, 1]$
- (c)  $(-\infty, -4] \cup [1, \infty)$
- (d)  $[-1, 4]$
- (e)  $(-\infty, -1] \cup [4, \infty)$

7. Find the distance between the points  $(5, 2)$  and  $(3, -4)$ .

$$D = \sqrt{(5-3)^2 + (2-(-4))^2}$$

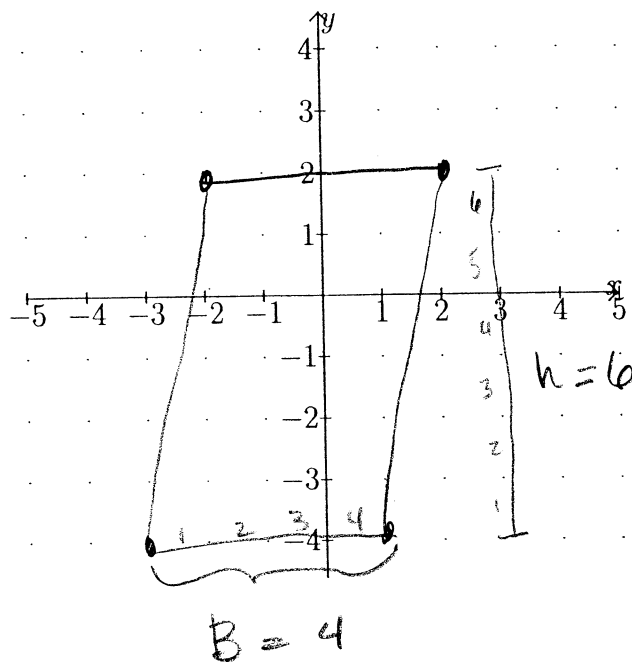
$$= \sqrt{4 + 36}$$

$$= \sqrt{40} = \sqrt{4 \cdot 10} = 2\sqrt{10}$$

Possibilities:

- (a)  $\sqrt{10}$
- (b)  $\sqrt{17}$
- (c)  $2\sqrt{2}$
- (d)  $2\sqrt{10}$
- (e)  $2\sqrt{17}$

8. Find the area of the parallelogram with vertices  $(-3, -4)$ ,  $(1, -4)$ ,  $(-2, 2)$ , and  $(2, 2)$ .



Possibilities:

- (a) 24 square units  
 (b) 26 square units  
 (c) 28 square units  
 (d) 30 square units  
 (e) 32 square units

$$A = Bh = 4 \cdot 6 = 24 \text{ square units}$$

9. Find the  $x$ -intercept and the  $y$ -intercept of the equation.

$$y = \sqrt{16 - x}$$

$x$ -int:  $(16, 0)$

$$y = 0$$

$$0 = \sqrt{16 - x}$$

$$16 = x$$

$y$ -int:  $(0, 4)$

$$x = 0$$

$$y = \sqrt{16 - 0}$$

$$y = \sqrt{16} = 4$$

Possibilities:

- (a) The  $x$ -intercept is  $(-4, 0)$  and the  $y$ -intercept is  $(0, 2)$   
 (b) The  $x$ -intercept is  $(2, 0)$  and the  $y$ -intercept is  $(0, 4)$   
 (c) The  $x$ -intercept is  $(4, 0)$  and the  $y$ -intercept is  $(0, 2)$   
 (d) The  $x$ -intercept is  $(4, 0)$  and the  $y$ -intercept is  $(0, 16)$   
 (e) The  $x$ -intercept is  $(16, 0)$  and the  $y$ -intercept is  $(0, 4)$

10. Find the radius of the circle.

$$x^2 + 4x + y^2 - 6y - 3 = 0$$

$$(x^2 + 4x) + (y^2 - 6y) = 3$$

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

$$(x + 4)^2 + (y - 3)^2 = 16$$

$$r^2 = 16$$

$$r = 4$$

Possibilities:

- (a) 2
- (b) 3
- (c) 4
- (d) 9
- (e) 16

11. Which line is perpendicular to

$$y = \frac{4}{3}x + 2$$

perpendicular lines will  
have slope  $-\frac{3}{4}$

Possibilities:

- (a)  $y = \frac{3}{4}x - \frac{1}{2}$
- (b)  $y = \frac{3}{4}x + \frac{1}{2}$
- (c)  $y = -\frac{3}{4}x - 2$
- (d)  $y = -\frac{4}{3}x - 2$
- (e)  $y = \frac{4}{3}x - 2$

12. Which line contains the point  $(-1, 7)$ ?

$(-1, 7)$  is a solution for

$$y = 7 + 2(x + 1)$$

because

$$7 = 7 + 2(-1 + 1)$$

is true.

$(-1, 7)$  is NOT a solution for any  
of the other equations.

Possibilities:

- (a)  $y = 1 + 2(x + 7)$
- (b)  $y = 1 + 2(x - 7)$
- (c)  $y = -1 - 2(x - 7)$
- (d)  $y = 1 - 2(x - 7)$
- (e)  $y = 7 + 2(x + 1)$

13. Find the slope of the line through the points  $(3, -1)$  and  $(5, 4)$ .

Possibilities:

- (a)  $\frac{8}{3}$
- (b)  $\frac{5}{2}$
- (c)  $\frac{4}{5}$
- (d)  $\frac{3}{8}$
- (e)  $\frac{2}{5}$

$$m = \frac{4 - (-1)}{5 - 3} = \frac{5}{2}$$

14. How many solutions does the following system of equations have?

$$\begin{cases} x + y = 7 & \leftarrow \text{slope} = -1 \\ 2x - 2y = 14 & \leftarrow \text{slope} = 1 \end{cases}$$

Possibilities:

- (a) Zero solutions
- (b) One solution
- (c) Two solutions
- (d) Three solutions
- (e) Infinitely many solutions

These lines have different slopes so there is only one solution

15. Find the midpoint of the segment that joins  $(1, 0)$  and  $(3, 1)$

Possibilities:

- (a)  $(3, 2)$
- (b)  $(6, 6)$
- (c)  $(7, 7)$
- (d)  $(1, \frac{1}{2})$
- (e)  $(2, \frac{1}{2})$

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

### Short Answer Questions

Clearly write your answers in the Answer Box on the front page of this test.

16. Find all real solutions of the equation.

$$x^2(x+12) \left( \frac{1}{x+12} - \frac{1}{x^2} \right) = 0 \quad x^2(x+12)$$

Note:  $x \neq 0$   
 $x \neq -12$

$$x^2 - (x+12) = 0$$

$$x^2 - x - 12 = 0$$

$$(x-4)(x+3) = 0$$

Solutions:  
 $x_1 = 4, x_2 = -3$

17. Find all real solutions of the equation.

$$|x+3| - 2 = 4$$

$$|x+3| = 6$$

$$x+3 = 6$$

$$x = 3$$

$$x+3 = -6$$

$$x = -9$$

18. Find an equation for the circle that has center  $C(3, -1)$  and radius  $r = 2$ .

$$(x-3)^2 + (y+1)^2 = 4$$

19. Find an equation of the line through  $(-3, 5)$  and having slope 4.

$$y - 5 = 4(x + 3)$$

20. Find all solutions of the system of equations.

$$\begin{cases} 3x + 2y = 6 \\ -2x + 3y = 10 \end{cases} \rightarrow$$

$$\begin{array}{r} 6x + 9y = 18 \\ -6x - 8y = -20 \\ \hline y = -2 \end{array}$$

$$2x + 3(-2) = 6$$

$$2x - 6 = 6$$

$$2x = 12$$

$$x = 6$$