

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.

Part I consists of 12 multiple choice questions worth 5 points each. Record your answers on this page by filling 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.

Part II consists of 4 partial credit problems worth a total of 40 points. Write your answer and show ALL your work on the page on which the question appears.

GOOD LUCK!

1. a b c d e

7. a b c d e

2. a b c d e

8. a b c d e

3. a b c d e

9. a b c d e

4. a b c d e

10. a b c d e

5. a b c d e

11. a b c d e

6. a b c d e

12. a b c d e

For grading use:

Question	Score	Total
1-12		60
13		10
14		10
15		10
16		10
Total	(out of 100 pts)	100

Please make sure to list the correct section number on the front page of your exam.
In case you forgot your section number, consult the following table:

Section #	Instructor	Lectures
002	W. Guo	MWF 9:00am-9:50am, BE 213
003	G. Butcher	MWF 10:00am-10:50am, CB 337
004	A. Bagchi Misra	MWF 10:00am-10:50am, FB 213
005	G. Butcher	MWF 11:00am-11:50am, CB 335
006	A. Corso	MWF 12:00pm-12:50pm, CB 114
008	W. Guo	MWF 1:00pm-1:50pm, CB 335
009	L. Roberson	MWF 2:00pm-2:50pm, CB 337
010	A. Bagchi Misra	MWF 3:00pm-3:50pm, CB 335
011	L. Roberson	MWF 3:00pm-3:50pm, CB 337
013	S. Nanwani	TR 8:00am-9:15am, CB 335
019	P. Zhang	TR 12:30pm-1:45pm, BS 108
020	S. Nanwani	TR 2:00pm-3:15pm, CB 333
021	Y. Li	TR 2:00pm-3:15pm, CB 347
022	Y. Li	TR 3:30pm-4:45pm, CB 335
023	P. Zhang	TR 3:30pm-4:45pm, CB 339
401	C. Norman	TR 6:00pm-7:15pm, CP 201
403	E. Stokes	TR 6:00pm-7:15pm, CB 337
404	E. Stokes	TR 7:30pm-8:45pm, CB 337

PART I

Multiple Choice Questions (5 points each)

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. If we simplify the expression

$$\frac{\frac{5}{6}}{\frac{10}{3} + \frac{1}{6}}$$

we obtain:

Possibilities:

(a) $\frac{15}{22}$

(b) $\frac{5}{21}$

(c) $\frac{55}{54}$

(d) $\frac{35}{12}$

(e) $\frac{21}{4}$

$$\frac{\frac{5}{6}}{\frac{20+1}{6}} = \frac{5}{6} \cdot \frac{6}{21} = \frac{5}{21}$$

2. If we simplify the expression

$$\frac{(3r^3s^{-4})^2}{(rs^5)^{-1}}$$

we obtain:

Possibilities:

(a) $\frac{9r^7}{s^3}$

(b) $9r^4s^3$

(c) $\frac{3r^5}{s}$

(d) $\frac{3r^7}{s^3}$

(e) $9r^9s^{13}$

$$\begin{aligned} & 3^2 (r^3)^2 (s^{-4})^2 \cdot r s^5 \\ & 9 r^6 s^{-8} r s^5 \\ & 9 r^7 s^{-3} \\ & \frac{9r^7}{s^3} \end{aligned}$$

3. If we simplify the expression

we obtain:

Possibilities:

(a) $2\sqrt{10}$

(b) $4\sqrt{10}$

(c) $4\sqrt{2}$

(d) $2\sqrt{2}$

(e) 0

$$\sqrt{72} + \sqrt{18} - \sqrt{50},$$

$$= \sqrt{2 \cdot 36} + \sqrt{2 \cdot 9} - \sqrt{2 \cdot 25}$$

$$= 6\sqrt{2} + 3\sqrt{2} - 5\sqrt{2}$$

$$= (6 + 3 - 5)\sqrt{2}$$

$$= \boxed{4\sqrt{2}}$$

4. If we expand the expression

we obtain:

Possibilities:

(a) $(u^2 - v^2)^2$

(b) 0

(c) $4v^2$

(d) $2u^2 + 2v^2$

(e) $4uv$

$$(u+v)^2 - (u-v)^2,$$

$$u^2 + 2uv + v^2 - (u^2 - 2uv + v^2)$$

$$\cancel{u^2} + 2uv + \cancel{v^2} - \cancel{u^2} + 2uv - \cancel{v^2}$$

$$\boxed{4uv}$$

5. If we simplify the expression

we obtain:

Possibilities:

(a) $-x^3 + 4x^2 + 6x + 12$

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

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

(d) $-x^3 + 2x^2 + 6x + 12$

(e) none of the above

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

$$3x^2 + 6x + 12 - x^3 - x^2$$

$$\boxed{-x^3 + 2x^2 + 6x + 12}$$

6. If we simplify the expression

$$\frac{1}{2xy^2} + \frac{3x}{y^2} - \frac{2}{xy}$$

we obtain:

$$\frac{1 + 2 \times (3x) - 2(2y)}{2xy^2}$$

$$\frac{1 + 6x^2 - 4y}{2xy^2}$$

Possibilities:

(a) $\frac{3x - 1}{2xy^2 + y^2 - xy}$

(b) $\frac{3x - 1}{2xy^2}$

(c) $\frac{1 + 6x^2 - 4y}{2xy^2}$

(d) $\frac{1 + 3x - 2y}{2xy^2}$

(e) $\frac{1 + 3x - 2}{2xy^2 + y^2 - xy}$

7. If we completely factor the expression

$$x^3 + 3x^2 + 2x + 6,$$

we obtain:

$$x^2(x + 3) + 2(x + 3)$$

$$(x + 3)(x^2 + 2)$$

Possibilities:

(a) $(x^2 + 2)(x + 3)$

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

(c) $x^2(x + 3) + 2(x + 3)$

(d) It cannot be factored

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

8. If we completely factor the expression

$$x^3 + 2x^2 - 15x,$$

we obtain:

$$x(x^2 + 2x - 15)$$

Possibilities:

$$x(x+5)(x-3)$$

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

(b) $x(x + 5)(x - 3)$ ✓✓

(c) $x(x - 5)(x + 3)$

(d) $(x - 5)(x - 3)$

(e) $(x^2 - 3)(x + 5)$

9. Consider the equation

$$\frac{x^2 + 2x - 7}{x(x - 5)} = 1.$$

Which of the following values of x is a solution of the above equation?

Possibilities:

$$x^2 + 2x - 7 = x(x - 5)$$

(a) $x = 0$

(b) $x = 3$

(c) $x = 5$

(d) $x = 1$ ✓✓

(e) $x = 2$

$$\cancel{x^2} + 2x - 7 = \cancel{x^2} - 5x$$

$$2x + 5x = 7$$

$$7x = 7 \Rightarrow$$

$$\boxed{x = 1}$$

10. If we simplify the expression $(\sqrt{u} - \sqrt{v})(\sqrt{u} + \sqrt{v})$, we obtain:

$$(\sqrt{u})^2 - (\sqrt{v})^2$$

Possibilities:

(a) $\sqrt[4]{u} - \sqrt[4]{v}$

(b) $u^2 + v^2$

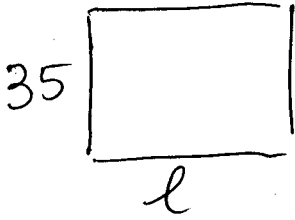
(c) $u^2 - v^2$

(d) $u + v$

(e) $u - v$ ✓✓

$$u - v$$

11. A rectangular garden is 35 feet wide. If its area is 1575 square feet, what is the perimeter of the garden?



$$\text{Area} = 1575 = 35 \cdot l$$

$$\therefore l = \frac{1575}{35} = 45$$

$$\begin{aligned} \therefore \text{perimeter} &= 2 \cdot w + 2l \\ &= 2 \cdot 35 + 2 \cdot 45 \\ &= 70 + 90 \\ &= \underline{160} \end{aligned}$$

Possibilities:

(a) 80 feet

(b) 160 feet

(c) 45 feet

(d) 90 feet

(e) 70 feet

12. Find the distance between $-\frac{1}{2}$ and $\frac{1}{3}$.

$$\left| \frac{1}{3} - \left(-\frac{1}{2}\right) \right| = \left| \frac{1}{3} + \frac{1}{2} \right|$$

$$= \left| \frac{2+3}{6} \right| = \boxed{\frac{5}{6}}$$

Possibilities:

(a) $\frac{1}{6}$

(b) $-\frac{5}{6}$

(c) $\frac{2}{3}$

(d) $\frac{5}{6}$

(e) $\frac{2}{5}$

PART II

Partial Credit Questions (10 points each)

Show all your work and put your final answer in the space provided.

Use the backs of the test sheets if you need more workspace.

No credit will be given for a correct answer without showing how it was obtained.

You will receive no credit if the answer is not in the space provided and no partial credit for a wrong answer if you do not show your work.

13. (a) Expand the following expression: $(x + y^2)(x^2 - xy^2 + y^4)$.

$$\begin{aligned}
 &= x \cdot x^2 - x(xy^2) + xy^4 + \\
 &\quad + y^2x^2 - y^2(xy^2) + y^2 \cdot y^4 \\
 &= x^3 - \cancel{xy^2} + \cancel{xy^4} + \cancel{x^2y^2} - \cancel{xy^4} + y^6 \\
 &= \boxed{x^3 + y^6}
 \end{aligned}$$

Answer: _____

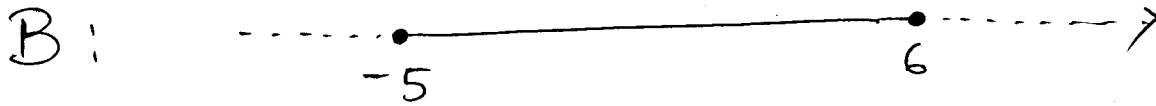
(b) Simplify the following expression by rationalizing the denominator: $\frac{1}{4 - \sqrt{3}}$.

$$\begin{aligned}
 \frac{1}{4 - \sqrt{3}} \cdot \frac{4 + \sqrt{3}}{4 + \sqrt{3}} &= \frac{4 + \sqrt{3}}{4^2 - (\sqrt{3})^2} = \\
 &= \frac{4 + \sqrt{3}}{16 - 3} = \boxed{\frac{4 + \sqrt{3}}{13}} \quad \checkmark \checkmark
 \end{aligned}$$

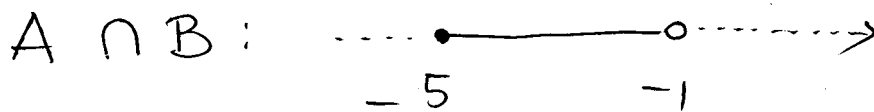
Answer: _____

pts: /10

14. (a) Consider the sets $A = \{x \mid x < -1\}$ and $B = \{x \mid -5 \leq x \leq 6\}$.
Graph A and B on a number line.



- (b) Find $A \cup B$ and $A \cap B$.



Answer: $A \cup B = \{x \mid x \leq 6\}$

Answer: $A \cap B = \{x \mid -5 \leq x < -1\}$

pts: /10

15. Perform the indicated operations and simplify:

$$(a) \frac{2}{x} + \frac{3}{x-2} - \frac{4}{x^2-2x}$$

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

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

$$x(x-2)$$

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

$$x(x-2)$$

$$\frac{5x - 8}{x(x-2)}$$

$$x(x-2)$$

Answer: _____

$$(b) \frac{x^2 + 2x - 3}{x^2 + 8x + 16} \cdot \frac{3x + 12}{x - 1}$$

$$\frac{(x+3)\cancel{(x-1)}}{(x+4)^2} \cdot \frac{3\cancel{(x+4)}}{\cancel{x-1}}$$

$$\frac{3(x+3)}{x+4}$$

$$\frac{3(x+3)}{x+4}$$

$$x+4$$

Answer: _____

pts: /10

16. Solve the following equations:

(a) $(t+2)^2 + 10 = (t-2)^2$

$$(\cancel{t^2} + 4t + \cancel{4}) + 10 = \cancel{t^2} - 4t + \cancel{4}$$

$$4t + 4t = -10$$

$$8t = -10$$

$$t = -\frac{10}{8} = -\frac{5}{4}$$

Answer: _____

(b) $\frac{4}{x-1} + \frac{2}{x+1} = \frac{38}{x^2-1}$

Multiply both sides by $x^2-1 = (x+1)(x-1)$

$$(x^2-1) \left[\frac{4}{x-1} + \frac{2}{x+1} \right] = (x^2-1) \cdot \frac{38}{x^2-1}$$

$$4(x+1) + 2(x-1) = 38$$

$$4x + 4 + 2x - 2 = 38$$

$$6x = 38 - 4 + 2$$

$$6x = 36$$

Answer: _____

$$\boxed{x = 6}$$

pts: /10