

Intermediate Algebra Exam 3 Forms A, B Dr. Rapalje

INTERMEDIATE ALGEBRA EXAM 3 A*

NAME _____

SHOW ALL WORK ON THIS TEST OR ON SEPARATE PAPER. Circle answers.

TURN IN ALL WORKSHEETS. CALCULATORS ARE PERMITTED ON THIS TEST.

In 1-8, simplify completely:

1a) $\sqrt{64X^{10}}$

2a) $\sqrt{48}$

3a) $\sqrt{150X^{20}Y^9}$

b) $\sqrt[3]{-64X^6}$

b) $\sqrt[3]{48}$

b) $\sqrt[3]{80X^{20}Y^9}$

In 4 - 6, give a) simplest radical form;

b) calculator value (nearest hundredth).

4. $3\sqrt{77} \cdot 5\sqrt{21}$

5. $5\sqrt[3]{40} + 2\sqrt[3]{320}$

6. Simplify the radical and give calculator value:

$$(3\sqrt{6} - 6\sqrt{3})^2$$

In 7 - 9, rationalize the denominators:

7. $\frac{18}{\sqrt{6} + \sqrt{3}}$

8. $\frac{18}{\sqrt{8}}$

9. $\frac{18}{\sqrt[3]{2}}$

In 10 - 11, simplify:

10 a) $32^{\frac{1}{5}}$

b) $125^{\frac{2}{3}}$

c) $8^{-\frac{4}{3}}$

11 a) $(-64)^{-\frac{3}{2}}$

b) $(-64)^{-\frac{2}{3}}$

c) $-64^{-\frac{2}{3}}$

In 12 - 13, give answer in $a + bi$ form:

12. $(3 + 2i)(5 - 4i)$

13. $\frac{19 - 4i}{2 + 3i}$

In 14 - 15, solve for X:

14. $\sqrt[3]{2X + 3} = 5$

15. $\sqrt{2X + 15} = 2X + 3$

EXAM 3 A* Solutions

1a) $\sqrt{64x^{10}} = 8x^5$

2a) $\sqrt{48} = \sqrt{16 \cdot 3} = 4\sqrt{3}$

3a) $\sqrt{150x^{20}y^9}$

b) $\sqrt[3]{80x^{20}y^9}$

b) $\sqrt[3]{-64x^6} = -4x^2$

c) $\sqrt[3]{48} = \sqrt[3]{8 \cdot 6} = 2\sqrt[3]{6}$

$= \sqrt{25x^{20}y^8} \sqrt{6y} = \sqrt[3]{8x^{18}y^3} \sqrt[3]{10x^2}$
 $= 5x^{10}y^4 \sqrt{6y} = 2x^6y^3 \sqrt[3]{10x^2}$

4. $3\sqrt{77} \cdot 5 \cdot \sqrt{21}$
 $= 15\sqrt{7 \cdot 11 \cdot 7 \cdot 3}$
 $= 15\sqrt{7^2 \cdot 33}$
 $= 15 \cdot 7 \sqrt{33}$
 $= 105\sqrt{33} = 603.18$

5. $5\sqrt[3]{40} + 2\sqrt[3]{320}$
 $= 5\sqrt[3]{8 \cdot 5} + 2\sqrt[3]{64 \cdot 5}$
 $= 5 \cdot 2 \sqrt[3]{5} + 2 \cdot 4 \sqrt[3]{5}$
 $= 10\sqrt[3]{5} + 8\sqrt[3]{5}$
 $= 18\sqrt[3]{5} = 70.278$

6. $(3\sqrt{6} - 6\sqrt{3})(3\sqrt{6} - 6\sqrt{3})$
 $= 9\sqrt{36} - 18\sqrt{18} - 18\sqrt{18} + 36 \cdot 9$
 $= 9 \cdot 6 - 36\sqrt{18} + 36 \cdot 3$
 $= 54 - 36 \cdot \sqrt{9 \cdot 2} + 108$
 $= 162 - 108\sqrt{2} = 9.26$

7. $\frac{18(\sqrt{6}-\sqrt{3})}{(\sqrt{6}+\sqrt{3})(\sqrt{6}-\sqrt{3})}$
 $= \frac{18(\sqrt{6}-\sqrt{3})}{6-3}$
 $= 6(\sqrt{6}-\sqrt{3})$

8. $\frac{18}{\sqrt{8}} = \frac{9\sqrt{2}}{2}$

10a) $32^{1/5} = \sqrt[5]{32} = 2$

11a) $(-64)^{-3/2} = \frac{1}{(\sqrt{-64})^3}$

9. $\frac{18\sqrt[3]{4}}{\sqrt[3]{2}\sqrt[3]{4}} = \frac{18\sqrt[3]{4}}{\sqrt[3]{8}}$
 $= \frac{18\sqrt[3]{4}}{2} = 9\sqrt[3]{4}$

b) $125^{2/3} = (\sqrt[3]{125})^2 = 5^2 = 25$

b) $(-64)^{-2/3} = \frac{1}{(\sqrt[3]{-64})^2} = \frac{1}{(-4)^2} = \frac{1}{16}$

c) $8^{4/3} = (\sqrt[3]{8})^4 = 2^4 = 16$

c) $(-64)^{-1/3} = \frac{1}{(\sqrt[3]{-64})} = \frac{1}{-4} = -\frac{1}{4}$

12. $(3+2i)(5-4i)$
 $= 15 - 12i + 10i - 8i^2$
 $= 15 - 2i + 8$
 $= 23 - 2i$

13. $\frac{(19-4i)(2-3i)}{(2+3i)(2-3i)}$
 $= \frac{38 - 57i - 8i + 12i^2}{4 - 9i^2}$
 $= \frac{38 - 65i - 12}{4 + 9}$

c) $(-64)^{-2/3} = \frac{1}{(\sqrt[3]{-64})^2} = \frac{1}{(-4)^2} = \frac{1}{16}$

14. $(\sqrt[3]{2x+3})^3 = (5)^3$
 $2x+3 = 125$
 $2x = 122$
 $x = 61$

$= \frac{26 - 65i}{13} = \frac{26}{13} - \frac{65}{13}i$
 $= 2 - 5i$

Ch: (Optional why?)
 $\sqrt[3]{122+3} = 5$
 $\sqrt[3]{125} = 5 \checkmark$

15. $\sqrt{2x+15} = 2x+3$
 $2x+15 = (2x+3)^2$
 $2x+15 = 4x^2 + 12x + 9$
 $-2x - 15$

$0 = 4x^2 + 10x - 6$
 $0 = 2(2x^2 + 5x - 3)$
 $(2x-1)(x+3)$
 $x = 1/2 \quad x = -3$

Ch: $x = 1/2$
 $\sqrt{1+15} = 1+3$
 $4 = 4$
 Ch: $x = -3$
 $\sqrt{-6+15} = -6+3$
 $\sqrt{9} = -3$ No Way!

INTERMEDIATE ALGEBRA EXAM 3 B* NAME _____
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In 1-8, simplify completely:

1a) $\sqrt{25X^{12}}$

2a) $\sqrt{80}$

3a) $\sqrt{250X^{10}Y^9}$

b) $\sqrt[3]{-125X^{12}}$

b) $\sqrt[3]{80}$

b) $\sqrt[3]{250X^{10}Y^9}$

In 4 - 6, give a) simplest radical form;
b) calculator value (nearest hundredth).

4. $4\sqrt{77} \cdot 5\sqrt{22}$

5. $4\sqrt[3]{24} - 5\sqrt[3]{81}$

6. Simplify the radical and give calculator value:

$$(10\sqrt{5} + 5\sqrt{10})^2$$

In 7 - 9, rationalize the denominators:

7. $\frac{6}{\sqrt{6} - \sqrt{2}}$

8. $\frac{18}{\sqrt{27}}$

9. $\frac{18}{\sqrt[3]{9}}$

In 10 - 11 simplify,

10a) $25^{\frac{3}{2}}$

b) $(-25)^{-\frac{1}{2}}$

c) $-25^{-\frac{1}{2}}$

11a) $27^{\frac{1}{3}}$

b) $8^{-\frac{2}{3}}$

c) $(-27)^{-\frac{2}{3}}$

In 12 - 13, give answer in $a + bi$ form:

12. $(3 + 5i)(4 - 3i)$

13. $\frac{22 + 14i}{3 + 5i}$

In 14 - 15, solve for X:

14. $\sqrt[3]{5X + 7} = -2$

15. $\sqrt{2X} - \sqrt{3X + 1} = 1$

EXAM 3B* Solutions

1a) $\sqrt{25x^{12}} = 5x^6$

2a) $\sqrt{80} = \sqrt{16 \cdot 5} = 4\sqrt{5}$

3a) $\sqrt{250x^{10}y^9}$

b) $\sqrt[3]{-125x^{12}} = -5x^4$

A) $\sqrt[3]{80} = \sqrt[3]{8 \cdot 10} = 2\sqrt[3]{10}$

B) $\sqrt[3]{250x^{10}y^9} = \sqrt[3]{25x^{10}y^9} \sqrt[3]{10y} = \sqrt[3]{125x^9y^9} \sqrt[3]{2x} = 5x^3y^3\sqrt[3]{2x}$

4. $4\sqrt{77} \cdot 5\sqrt{22}$
 $= 20\sqrt{7 \cdot 11 \cdot 2 \cdot 11}$
 $= 20\sqrt{11^2 \cdot 14}$
 $= 20 \cdot 11\sqrt{14}$
 $= 220\sqrt{14}$

5. $4\sqrt[3]{24} - 5\sqrt[3]{81}$
 $= 4\sqrt[3]{8 \cdot 3} - 5\sqrt[3]{27 \cdot 3}$
 $= 4 \cdot 2\sqrt[3]{3} - 5 \cdot 3\sqrt[3]{3}$
 $= 8\sqrt[3]{3} - 15\sqrt[3]{3}$
 $= -7\sqrt[3]{3} = 70.10$

6. $(10\sqrt{5} + 5\sqrt{10})(10\sqrt{5} + 5\sqrt{10})$
 $= 100\sqrt{25} + 50\sqrt{50} + 50\sqrt{50} + 25\sqrt{100}$
 $= 100 \cdot 5 + 100\sqrt{50} + 25 \cdot 10$
 $= 500 + 100\sqrt{25 \cdot 2} + 250$
 $= 750 + 500\sqrt{2} = 1457.11$

7. $\frac{6}{(\sqrt{6}-\sqrt{2})(\sqrt{6}+\sqrt{2})}$
 $= \frac{6(\sqrt{6}+\sqrt{2})}{6-2}$
 $= \frac{6(\sqrt{6}+\sqrt{2})}{4}$
 $= \frac{3(\sqrt{6}+\sqrt{2})}{2}$

823.16

8. $\frac{18}{\sqrt{27}} = \frac{18\sqrt{3}}{3\sqrt{3}\sqrt{3}}$
 $= \frac{18\sqrt{3}}{9} = 2\sqrt{3}$

9. $\frac{18\sqrt[3]{3}}{\sqrt[3]{9 \cdot 3}} = \frac{18\sqrt[3]{3}}{3}$
 $= 6\sqrt[3]{3}$

10a) $25^{3/2} = (\sqrt{25})^3 = 125$

b) $(-25)^{-1/2} = \frac{1}{\sqrt{-25}}$
 No Real Sol

c) $-25^{-1/2} = -\frac{1}{\sqrt{25}} = -\frac{1}{5}$

11a) $27^{1/3} = \sqrt[3]{27} = 3$

b) $8^{-2/3} = \frac{1}{\sqrt[3]{8^2}} = \frac{1}{4}$

c) $(-27)^{-2/3} = \frac{1}{\sqrt[3]{(-27)^2}} = \frac{1}{9}$

12. $(3+5i)(4-3i)$
 $= 12 - 9i + 20i - 15i^2$
 $= 12 + 11i + 15$
 $= 27 + 11i$

13. $\frac{(22+14i)(3-5i)}{(3+5i)(3-5i)}$
 $= \frac{66 - 110i + 42i - 70i^2}{9 - 25i^2}$
 $= \frac{66 - 68i + 70}{9 + 25}$
 $= \frac{136 - 68i}{34} = \frac{136}{34} - \frac{68i}{34}$
 $= 4 - 2i$

14. $(\sqrt[3]{5x+7})^3 = (-2)^3$
 $5x+7 = -8$
 $5x = -15$
 $x = -3$

Ch: optional

$\sqrt[3]{-15+7} = -2$
 $\sqrt[3]{-8} = -2 \checkmark$

15. $\sqrt{2x} - \sqrt{3x+1} = 1$

$\sqrt{2x} = \sqrt{3x+1} + 1$

$2x = 3x+1 + 2\sqrt{3x+1} + 1$

$(-x-2)^2 = (2\sqrt{3x+1})^2$

$x^2 + 4x + 4 = 4(3x+1) = 12x + 4$

$x^2 - 8x = 0$

$x(x-8) = 0$

~~x=0~~ $x=8$

Ch: $x=0$

$\sqrt{0} - \sqrt{1} = 1$

No!

Ch: $x=8$

$\sqrt{16} - \sqrt{25} = 1$

$4 - 5 = 1$
 No!