

College Algebra Exam 1 Forms A, B Dr. Rapalje

COLLEGE ALGEBRA EXAM 1 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 - 4, factor completely:

1. $Y^3 + 2Y^2 - 4Y - 8$

2. $(X-Y)^2 + 7(X-Y) - 8$

3. $2X^4 - 50X^2Y^4$

4. $X^6 - 64$

In 5 - 7, simplify the fractions completely:

5. $\frac{X^2-2X-3}{X^3+1} \div \frac{X^2-3X}{X^2-X+1}$

6. $\frac{3}{a+2} - \frac{2a-1}{a^2-a-6} + \frac{1}{a+3}$

In 8 - 9, simplify (rationalize denom):

7. $\frac{XY^{-1} + YX^{-1}}{X^{-2} + Y^{-2}}$

8. $\frac{12}{\sqrt[3]{2}}$

9. $\frac{2\sqrt{7}}{3 - \sqrt{7}}$

In 10 - 15, solve for X:

10. $2X^2 + 7X = 15$

11. $X^2 + 1 = 4X$

12. $F = \frac{XY}{Y + X}$

13. $2 - X = \sqrt{X + 10}$

14. $\frac{1}{x-2} + \frac{3}{X+3} = \frac{4}{X^2+X-6}$

15. $(X - 1)^{\frac{2}{3}} + (X - 1)^{\frac{1}{3}} = 12$

In 16 - 17, solve the inequalities. Give interval notation.

16. $|2X - 3| < 7$

17. $X^2 - 2X \geq 8$

18. $(X + Y)^{\frac{3}{2}} + 7(X + Y)^{\frac{1}{2}}$

19. $\frac{1}{h} \left[\frac{1}{X+h} - \frac{1}{X} \right]$

20. Use a calculator.
Give scientific notation or
round to nearest hundredth.

a) $800,000 \times 900,000$

b) 15.85^{12}

c) $\sqrt{73,500}$

d) $\sqrt[3]{73,500}$

21. The area of a rectangle is 20
sq.cm. If the base is 3 more
than twice the height, find the
dimensions of the rectangle.

COLLEGE ALGEBRA EXAM 1A Solutions

1. $y^3 + 2y^2 - 4y - 8 = y^2(y+2) - 4(y+2) = (y+2)(y^2-4) = (y+2)^2(y-2)$

2. $(x-y)^2 + 7(x-y) - 8 = [(x-y)+8][(x-y)-1] = (x-y+8)(x-y-1)$

3. $2x^4 - 50x^2y^2 + 4 = 2x^2(x^2 - 25y^2) + 4 = 2x^2(x-5y)(x+5y) + 4$

4. $x^6 - 64 = (x^3-8)(x^3+8) = (x-2)(x^2+2x+4)(x+2)(x^2-2x+4)$

5. $\frac{x^2-2x-3}{x^3+1} \div \frac{x^2-3x}{x^2+x+1} = \frac{(x-3)(x+1)}{(x+1)(x^2+x+1)} \cdot \frac{x^2+x+1}{x(x-3)} = \frac{1}{x}$

6. $\frac{3}{a+2} - \frac{2a-1}{(a-3)(a+2)} + \frac{1}{a+3} = \frac{3(a-3)(a+3) - (2a-1)(a+3) + (a-3)(a+2)}{(a+2)(a-3)(a+3)} = \frac{2a^2 - 6a - 30}{(a+2)(a-3)(a+3)}$

7. $\frac{xy^{-1} + yx^{-1}}{x^{-2} + y^{-2}} = \frac{\frac{x}{y} + \frac{y}{x}}{\frac{1}{x^2} + \frac{1}{y^2}} = \left(\frac{x}{y} + \frac{y}{x}\right) \div \left(\frac{1}{x^2} + \frac{1}{y^2}\right) = \frac{x^2y^2}{xy} \div \frac{y^2x^2}{xy^2} = xy$

8. $\frac{12\sqrt[3]{4}}{\sqrt{2}\sqrt[3]{4}} = \frac{12\sqrt[3]{4}}{2} = 6\sqrt[3]{4}$

9. $\frac{2\sqrt{7}(3+\sqrt{7})}{(3-\sqrt{7})(3+\sqrt{7})} = \frac{2\sqrt{7}(3+\sqrt{7})}{9-7} = \frac{2\sqrt{7}(3+\sqrt{7})}{2} = 3\sqrt{7} + 7$

10. $2x^2 + 7x - 15 = 0 \Rightarrow (2x-3)(x+5) = 0 \Rightarrow x = \frac{3}{2}, x = -5$

11. $x^2 - 4x = -1 \Rightarrow x^2 - 4x + 4 = -1 + 4 \Rightarrow (x-2)^2 = 3 \Rightarrow x = 2 \pm \sqrt{3}$
(or use Quad formula!)

12. $F = \frac{xy}{y+x}$
 $Fy + Fx = xy$
 $Fy = xy - Fx$
 $Fy = x(y-F) \Rightarrow x = \frac{Fy}{y-F}$

13. $(2-x)^2 = (\sqrt{x+10})^2 \Rightarrow 4-4x+x^2 = x+10 \Rightarrow x^2-5x-6=0 \Rightarrow (x-6)(x+1)=0 \Rightarrow x=6, x=-1$
 ck: $2-6 = \sqrt{16} \Rightarrow 2-6 = -4 \neq 4$ No!
 ck: $2-(-1) = \sqrt{9} \Rightarrow 2-(-1) = 3 = 3$

14. $\frac{1}{x-2} + \frac{3}{x+3} = \frac{4}{(x+3)(x-2)}$
 $x+3 + 3(x-2) = 4$
 $x+3 + 3x-6 = 4$
 $4x = 7 \Rightarrow x = \frac{7}{4}$

15. $(x-1)^{2/3} + (x-1)^{1/3} = 12$
 Let $u = (x-1)^{1/3}$
 $u^2 + u - 12 = 0 \Rightarrow (u+4)(u-3) = 0 \Rightarrow u = -4, u = 3$
 $[(x-1)^{1/3}]^3 = [4]^3 \Rightarrow (x-1)^{1/3} = 4 \Rightarrow x-1 = 64 \Rightarrow x = 65$
 $[(x-1)^{1/3}]^3 = [3]^3 \Rightarrow (x-1)^{1/3} = 3 \Rightarrow x-1 = 27 \Rightarrow x = 28$

16. $|2x-3| < 7$ Betweenness
 $-7 < 2x-3 < 7$
 $+3 \quad +3 \quad +3$
 $-4 < 2x < 10$
 $-2 < x < 5 \Rightarrow (-2, 5)$

7. $x^2 - 2x \geq 8$ EXTREMES
 $x^2 - 2x - 8 = 0$ Endpts.
 $(x-4)(x+2) = 0$
 $x = 4, x = -2$
 $(-\infty, -2] \cup [4, \infty)$

18. $(x+y)^{3/2} + 7(x+y)^{1/2}$
 $(x+y)^{1/2} [x+y+7]$

19. $\frac{1}{h} \left[\frac{1}{x+h} - \frac{1}{x} \right] = \frac{1}{h} \left[\frac{x-x-h}{x(x+h)} \right] = \frac{1}{h} \left[\frac{-h}{x(x+h)} \right] = \frac{-1}{x(x+h)}$

20a) 7.2×10^{11}
 b) 3.51×10^{14}
 c) 271.11
 d) 41.89

21. Let $x = \text{width}$
 $2x+3 = \text{length}$
 $x(2x+3) = 20 \Rightarrow 2x^2+3x-20=0 \Rightarrow (2x-5)(x+4)=0 \Rightarrow x = \frac{5}{2} \text{ cm}, x = -4$
 $2x+3 = 8 \text{ cm}$

COLLEGE ALGEBRA EXAM 1B NAME _____

Show all work on this test or on separate paper.
Turn in ALL work sheets. Calculators are required.

1. Simplify:

a) $\sqrt{72x^7y^8}$

b) $\sqrt[3]{72x^7y^8}$

Rationalize the denominator:
$$\frac{5}{2\sqrt{10}-5}$$

3. Simplify:
 $(-64)^{-\frac{2}{3}}$

4. Multiply (or expand):
 $(x+2)^3$

5. Factor completely:
 $x^3 - 8x^2 - 4x + 32$

6. Factor completely:
 $8x^3 - 125y^6$

7. Factor completely:
 $(x+2y)^2 - 3(x+2y) - 18$

8. Factor completely:
 $(1+x^2)^{\frac{3}{2}} + 8(1+x^2)^{\frac{1}{2}}$

9. $\frac{5}{x^2-x-2} - \frac{6}{x^2+x-6}$

10. $\frac{1 + \frac{1}{x-1}}{1 - \frac{1}{x+1}}$

11. The length of a rectangle is 2 less than 3 times the width. Write an expression (in terms of x) for a) the perimeter
b) the area.

12. Solve for x :
 $(x+3)^2 = 6$

13. Solve for x :
 $x^2 = 2(3x-5)$

14. Solve for x :
$$\frac{x+3}{x^2-x} - \frac{x}{x^2-1} = \frac{3}{x^2+x}$$

15. Solve and check:
 $\sqrt{3x} = 1 - \sqrt{5x+1}$

16. Solve:
 $x^4 - 10x^2 + 9 = 0$

In 17-20, give interval notation:

17. $4-2x \geq 6$ 18. $|4-2x| \geq 6$ 19. $x^2-2x < 8$

In 20-21, give scientific notation, to nearest hundredth.

20. Use calculator:

a) $7,600,000 \times 8,400,000$

b) $8.6 \times 10^{12} \cdot 4.96 \times 10^{-20}$

21. Use calculator:

a) $7842 (3.45 + 7.9)^3$

b)
$$\frac{92000}{\sqrt{0.00003}}$$

COLLEGE ALGEBRA EXAM 1B SOLUTIONS

Show all work on this test or on separate paper.

Turn in ALL work sheets. Calculators are required.

1. Simplify:

$$a) \sqrt{72x^7y^8} \\ = \sqrt{36x^6y^8} \sqrt{2x} = \boxed{6x^3y^4\sqrt{2x}}$$

$$b) \sqrt[3]{72x^7y^8} \\ = \sqrt[3]{8x^6y^6} \sqrt[3]{9xy^2} \\ = \boxed{2x^2y^2\sqrt[3]{9xy^2}}$$

2. Rationalize the

$$\text{denominator:} \\ \frac{5(2\sqrt{10}+5)}{(2\sqrt{10}-5)(2\sqrt{10}+5)} \\ = \frac{5(2\sqrt{10}+5)}{4 \cdot 10 - 25} \\ = \frac{5(2\sqrt{10}+5)}{15} \\ = \boxed{\frac{2\sqrt{10}+5}{3}}$$

3. Simplify:

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

4. Multiply (or expand):

$$(x+2)^3 \\ (x+2)(x+2)(x+2) \\ (x+2)(x^2+4x+4) \\ = x^3 + 4x^2 + 4x \\ + 2x^2 + 8x + 8 \\ \boxed{x^3 + 6x^2 + 12x + 8}$$

5. Factor completely:

$$x^3 - 8x^2 - 4x + 32 \\ x^2(x-8) - 4(x-8) \\ (x-8)(x^2-4) \\ \boxed{(x-8)(x-2)(x+2)}$$

6. Factor completely:

$$8x^3 - 125y^6 \\ \boxed{(2x-5y^2)(4x^2+10xy^2+25y^4)}$$

7. Factor completely:

$$(x+2y)^2 - 3(x+2y) - 18 \\ \boxed{(x+2y-6)(x+2y+3)}$$

8. Factor completely:

$$(1+x^2)^{3/2} + 8(1+x^2)^{1/2} \\ (1+x^2)^{1/2} [1+x^2+8] \\ \boxed{(1+x^2)^{1/2}(x^2+9)}$$

$$9. \frac{5(x+3)}{x^2-x-2(x+3)} - \frac{6(x+1)}{x^2+x-6(x+1)} \\ \frac{5x+15-6x-6}{(x-2)(x+1)(x+3)}$$

$$\frac{-x+9}{(x-2)(x+1)(x+3)}$$

$$\boxed{\frac{-x+9}{(x-2)(x+1)(x+3)}}$$

$$10. 1 + \frac{1}{x-1} \\ 1 - \frac{1}{x+1}$$

$$\left(1 + \frac{1}{x-1}\right) \div \left(1 - \frac{1}{x+1}\right)$$

$$\frac{x-1+1}{x-1} \div \frac{x+1-1}{x+1}$$

$$\frac{x}{x-1} \cdot \frac{x+1}{x} = \boxed{\frac{x+1}{x-1}}$$

11. The length of a rectangle is 2 less than 3 times the width. Write an expression (in terms of x) for a) the perimeter b) the area.

Let x = width
 $3x - 2$ = length.
 $P = 2(x) + 2(3x - 2) = 8x - 4$
 $A = L \cdot W = x(3x - 2) = 3x^2 - 2x$

14. Solve for x :
 $\frac{x(x+3)}{x(x-1)} - \frac{x(x+1)}{(x-1)(x+1)} = \frac{3}{x(x+1)}$
 $x^2 + 4x + 3 - x^2 = 3x - 3$
 $x = -6$

(Note: $x \neq 0, 1, -1$)

12. Solve for x :

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

$$x+3 = \pm\sqrt{6}$$

$$x = -3 \pm \sqrt{6}$$

13. Solve for x :

$$x^2 = 2(3x-5)$$

$$x^2 = 6x - 10$$

$$x^2 - 6x + 9 = -10 + 9$$

$$(x-3)^2 = -1$$

$$x-3 = \pm i$$

$$x = 3 \pm i$$

15. Solve and check:

$$\sqrt{3x} = 1 - \sqrt{5x+1}$$

$$3x = 1 - 2\sqrt{5x+1} + 5x + 1$$

$$2\sqrt{5x+1} = 2x + 2$$

$$\sqrt{5x+1} = x + 1$$

$$5x + 1 = x^2 + 2x + 1$$

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

$$x = 0 \quad x = 3$$

$\sqrt{9} = 3$ $\sqrt{9} = 1 - \sqrt{16}$

16. Solve:

$$x^4 - 10x^2 + 9 = 0$$

$$(x^2 - 9)(x^2 - 1) = 0$$

$$(x-3)(x+3)(x-1)(x+1) = 0$$

$$x = 3 \quad x = -3 \quad x = 1 \quad x = -1$$

In 17-20, give interval notation:

17. $4 - 2x \geq 6$
 $-2x \geq 2$
 $x \leq -1$
 $(-\infty, -1]$

18. $|4 - 2x| \geq 6$ (EXTREMES)
 $4 - 2x \geq 6$ or $4 - 2x \leq -6$
 $-2x \geq 2$ $-2x \leq -10$
 $x \leq -1$ $x \geq 5$
 $(-\infty, -1] \cup [5, \infty)$

19. $x^2 - 2x \leq 8$ (BETWEEN/ANDS)
 $x^2 - 2x - 8 = 0$
 $(x-4)(x+2) = 0$
 $x = 4 \quad x = -2$
 $(-2, 4)$

In 20-21, give scientific notation, to nearest hundredth.

20. Use calculator:

a) $7,600,000 \times 8,400,000$
 6.38×10^{13}

b) $8.6 \times 10^{12} \cdot 4.96 \times 10^{-20}$
 4.27×10^{-7}

21. Use calculator:

a) $7842 (3.45 + 7.9)^3$
 1.15×10^7

b) $\frac{92000}{\sqrt{0.00003}}$ 1.68×10^7