

Name Key

MATD 0390  
*Intermediate Algebra*  
*Test 3*  
*Mike Huff*  
Spring 2009

**Deadline: 4/24/2009**

**Tools: scrap paper, calculator**

Name \_\_\_\_\_ *Intermediate Algebra Test 3 Mike Huff*

**Show all work on the test paper for full credit.**

$$f(2) = -4 - 2 + 2 = -4$$
$$g(2) = -3(2) + 4 = -2$$

8 1. Let  $f(x) = -x^2 - x + 2$  and  $g(x) = -3x + 4$ . Find

a)  $f(-3) = -9 + 3 + 2 = -4$

b)  $(f - g)(2) = f(2) - g(2) = -4 - (-2) = -4 + 2 = -2$

c)  $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{-x^2 - x + 2}{-3x + 4}$

d) The domain of  $\frac{f}{g}$ .  $x \neq \frac{4}{3}$

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6 2. Evaluate:

a)  $(-8)^{\frac{1}{3}} = -2$

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

5 3. Multiply:  $(3x + 2y)^2 = 9x^2 + 12xy + 4y^2$

4. Multiply and simplify:

6

$$\begin{aligned} \text{a) } \sqrt{12x^6y^7} \sqrt{36x^9y^{11}} &= \sqrt{2^4 \cdot 3^3 x^{15} y^{18}} \\ &= 2^2 \cdot 3 \cdot 2^2 \cdot 3^2 \quad = 4 \cdot 3 x^7 y^9 \sqrt{3x} \end{aligned}$$

$$\text{b) } \sqrt[3]{12x^7y^4} \sqrt[3]{12x^3y^{17}} = 12 x^7 y^9 \sqrt{3x}$$

$$\begin{aligned} &\sqrt[3]{2^4 \cdot 3^2 x^{10} y^{21}} \\ &= 2x^3 y^7 \sqrt[3]{2 \cdot 3^2 x} = 2x^3 y^7 \sqrt[3]{18x} \end{aligned}$$

5. Factor:  $x^4 - 81$

9

$$= (x^2 - 9)(x^2 + 9)$$

$$= (x+3)(x-3)(x^2+9)$$

6. Solve the following inequality:  $|2x - 3| \leq 5$

4

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

$$-2 \leq 2x \leq 8$$

$$-1 \leq x \leq 4 \quad \text{or} \quad [-1, 4]$$

7. Factor:  $4x^2 + 12x - 8xy - 24y$

9

$$= 4x(x+3) - 8y(x+3)$$

$$= (x+3)(4x-8y)$$

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

8. Use the formula  $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$  to factor

$$x^3 - 8$$

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

9. Solve:  $2x^2 + x = 3$

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

$$(2x + 3)(x - 1) = 0$$

$$x = -\frac{3}{2} \text{ or } x = +1$$

10. A plane flies 350 mph in still air. If it flies 487.5 mi into the wind and 487.5 miles with the wind in a total of 2.8 hr. Find the wind speed.

$$r \cdot t = d$$

into	$350 - x$	$\frac{487.5}{350 - x}$	487.5
with	$350 + x$	$\frac{487.5}{350 + x}$	487.5

$$\frac{487.5}{350 - x} + \frac{487.5}{350 + x} = 2.8$$

omit

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11. A small boat can travel 15 miles per hour in still water. If the boat travels 140 miles downriver in the same time it can travel 35 miles upriver, what is the speed of the ~~boat?~~ <sup>current</sup>

4

$r \cdot t = d$

down	$15+x$	$\frac{140}{15+x}$	140
up	$15-x$	$\frac{35}{15-x}$	35

$$\frac{140}{15+x} = \frac{35}{15-x}$$

$$140(15-x) = 35(15+x)$$

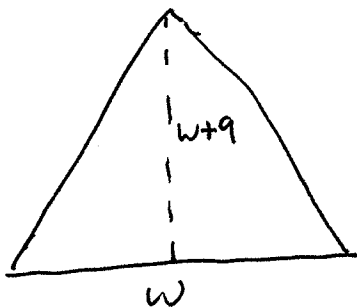
$$2100 - 140x = 525 + 35x$$

$$-175x = -1575$$

$$x = \frac{1575}{175} = 9 \text{ mph}$$

12. A triangular sail is 9 m taller than it is wide. The area is  $56 \text{ m}^2$ . Find the height and base of the sail.

9



$$\frac{1}{2}w(w+9) = 56$$

$$w^2 + 9w = 112$$

$$w^2 + 9w - 112 = 0$$

$$(w+16)(w-7) = 0$$

$$w = -16 \text{ or } w = 7$$

$$w = 7 \text{ m}$$

$$w + 9 = 16 \text{ m}$$

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13. Divide:  $\frac{x^2 + 7xy + 10y^2}{x^2 - 2xy - 8y^2} \div \frac{x^2 + xy - 2y^2}{x^2 - 5xy + 4y^2}$

$\frac{(x+5y)(x+2y)}{(x-4y)(x+2y)} \cdot \frac{(x-y)(x-4y)}{(x-y)(x+2y)}$

$\frac{x+5y}{x+2y}$

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14. Subtract:  $\frac{x}{x-2} - \frac{1}{x^2-4}$

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

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

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15. Simplify:  $\left(\frac{2a}{b} - a\right)b \div \left(a - \frac{a}{b}\right)b = \frac{2a-ab}{ab-a} = \frac{a(2-b)}{a(b-1)} =$

$\frac{2-b}{b-1}$

16. Solve:  $\left[ \frac{x}{x+1} + \frac{5}{x} = \frac{1}{x^2+x} \right] x(x+1)$

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

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

$$x^2 + 5x + 4 = 0$$

$$(x+4)(x+1) = 0$$

$$x = -4 \text{ or } x = -1$$

extraneous

$$x = -4 \text{ only}$$

17. Denise estimates that she can wax her car in 3 hours. Pat estimates that she can wax Denise's car in 2 hours. How long would it take them to wax the car if they work together?

	r	x	t = w
D	$\frac{1}{3}$	t	$\frac{t}{3}$
P	$\frac{1}{2}$	t	$\frac{t}{2}$

Let  $t$  = time needed for both to complete

$$\left( \frac{t}{3} + \frac{t}{2} = 1 \right) 6$$

$$2t + 3t = 6$$

$$5t = 6$$

$$t = \frac{6}{5} \text{ hrs}$$

18. Solve for  $a$ :  $\left[ \frac{1}{a} + \frac{1}{b} = \frac{1}{x} \right] abx$

$bx + ax = ab$

$bx = ab - ax$

$bx = a(b-x)$

$a = \frac{bx}{b-x}$

19. Find the variation constant and an equation of variation in which  $y$  varies inversely as  $x$  and  $y = 28$  when  $x = 4$ .

$y = \frac{k}{x}$

$28 = \frac{k}{4}$

$k = 4(28) = 112$

$k = 112$   
 $y = \frac{112}{x}$

20. Perform the indicated operation:  $\frac{\sqrt[3]{76x^{23}y^{12}}}{\sqrt[3]{4x^2y^3}}$

5

$$\begin{aligned} &= \sqrt[3]{\frac{76x^{23}y^{12}}{4x^2y^3}} \\ &= \sqrt[3]{19x^{21}y^9} \\ &= \boxed{x^7y^3\sqrt[3]{19}} \end{aligned}$$

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Extra credit (4 points)

21. Rationalize the denominator:  $\frac{(1+x)(2-\sqrt{x})}{(2+\sqrt{x})(2-\sqrt{x})}$

$$= \frac{2 - \sqrt{x} + 2x - x\sqrt{x}}{2^2 - \sqrt{x}^2}$$

$$= \boxed{\frac{2 - \sqrt{x} + 2x - x\sqrt{x}}{4 - x}}$$