Algebra 2 Review 006 Honors

Practice Questions and Solutions

Topics include radicals, rational exponents, completing the square, word problems, inequalities, and more.

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Algebra 2 Review 006 Multiple Choice

1) $7 > \frac{14}{x+1}$

a) $(-\infty, -1)$

b) $(-\infty, 1)$

c) $(1, \infty)$

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

e) $(-1, 1)$

2) A rectangle has length 70 more than its width. If the length of a diagonal is 130, what is the perimeter of the rectangle?

a) 210

b) 300

c) 340

d) 400

e) 540

3) $\frac{\sqrt{10}}{\sqrt{2}+\sqrt{5}} =$

a) $\frac{\sqrt{30}}{3}$

b) $\sqrt{5}-\sqrt{2}$

c) $\frac{5\sqrt{2}-2\sqrt{5}}{3}$

d) $\frac{\sqrt{20}+\sqrt{50}}{7}$

e) $\frac{1}{\sqrt{5}+\sqrt{2}}$

4) Solve $x^3 - 11x^2 + 31x = 21$

The SUM of the solutions is

a) 3

b) 7

c) 11

d) 14

e) 17

Algebra 2 Review 006 Multiple Choice

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5) $f(x) = 4x - \frac{3}{\sqrt{x+1}}$ What is the domain?

a) $x = -1$

b) $x > -1$

c) $x > 1$

d) $x < -1$

e) $x > 0$

6) $\frac{3}{4} - x^{-1} = 2x^{-1}$

a) -2

b) -1

c) 1

d) 2

e) 4

7) Is $f(x) = x^5 + 7x^3 + 8$ odd, even, or neither?

a) odd

b) even

c) neither

8) If wheel A makes 10 revolutions, how many revolutions will wheel C make?

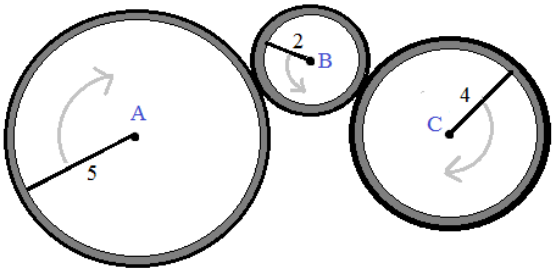
a) 6

b) 7.5

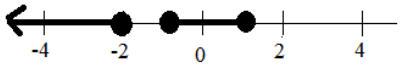
c) 8

d) 10

e) 12.5



9) $2x^3 + 4x^2 - 3x - 6 < 0$ Which is the best solution?

a)


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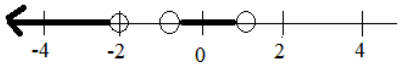

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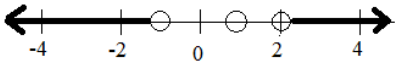

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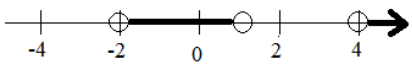

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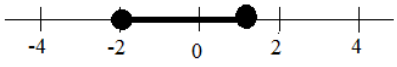


Simplify the following:

1) $\frac{3}{x^2} + \frac{4}{x} =$

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

3) $\frac{x^2 - 25}{x^2 - 4x} \cdot \frac{x^2 + x - 20}{x^2 + 10x + 25}$

4) $\dfrac{\frac{x^2 + 3x + 2}{x^2 - 1}}{\frac{4x^2 + 8x}{5(x - 1)}}$

5) $\left(\frac{x^2 + 5x + 4}{x^2 + 2x - 8}\right) \div \left(\frac{3x^2 + x - 2}{x^2 - 4}\right) =$

6) factor $16x^3 + 250$

7) $\dfrac{\frac{x}{y} - \frac{y}{x}}{\frac{1}{x^2} - \frac{1}{y^2}}$

Algebra 2 (honors) Practice Test

Solve:

1) $2 + \frac{x}{x+5} = 0$

2) $\frac{11}{3x} - \frac{1}{3} = \frac{-4}{x^2}$

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

Solve:

4) $3x^3 + 15x^2 = 0$

5) $9x^3 + 36x^2 - x = 4$

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

Simplify:

7) $x^{-3/2} - 2x^{-1/2} + x^{1/2}$

8) $64m^2 - n^2 - 4 + 4n$

***Challenge 9) $x^4 - 19x^2 + 9$

Solve by Completing the Square:

10) $x^2 + 4x = 7$

11) $-2x^2 + 9x + 3 = 0$

Solve using the Quadratic Formula:

12) $2x^2 + 8x = -4$

Fill in the blanks:

13) $(x + \_\_\_\_\_)^2 = x^2 + 8x + \_\_\_\_\_$

14) $(x + \_\_\_\_\_)^2 + \_\_\_\_\_ = x^2 + 14x + 9$

15) $3x^2 - 30x + 68 = 3(x^2 - \_\_\_\_x + \_\_\_\_\_) + \_\_\_\_\_ + 68 = 3(x - \_\_\_\_\_)^2 + \_\_\_\_\_$

16) If Jim can paint a fence in 6 hours, and Tim can paint a fence in 4 hours.
How long will it take them to paint a fence *working together*?

17) A girl can wash the windows in 45 minutes.
Working with her brother, they can wash the windows in 20 minutes.

Working by himself, how fast can the brother wash the windows?

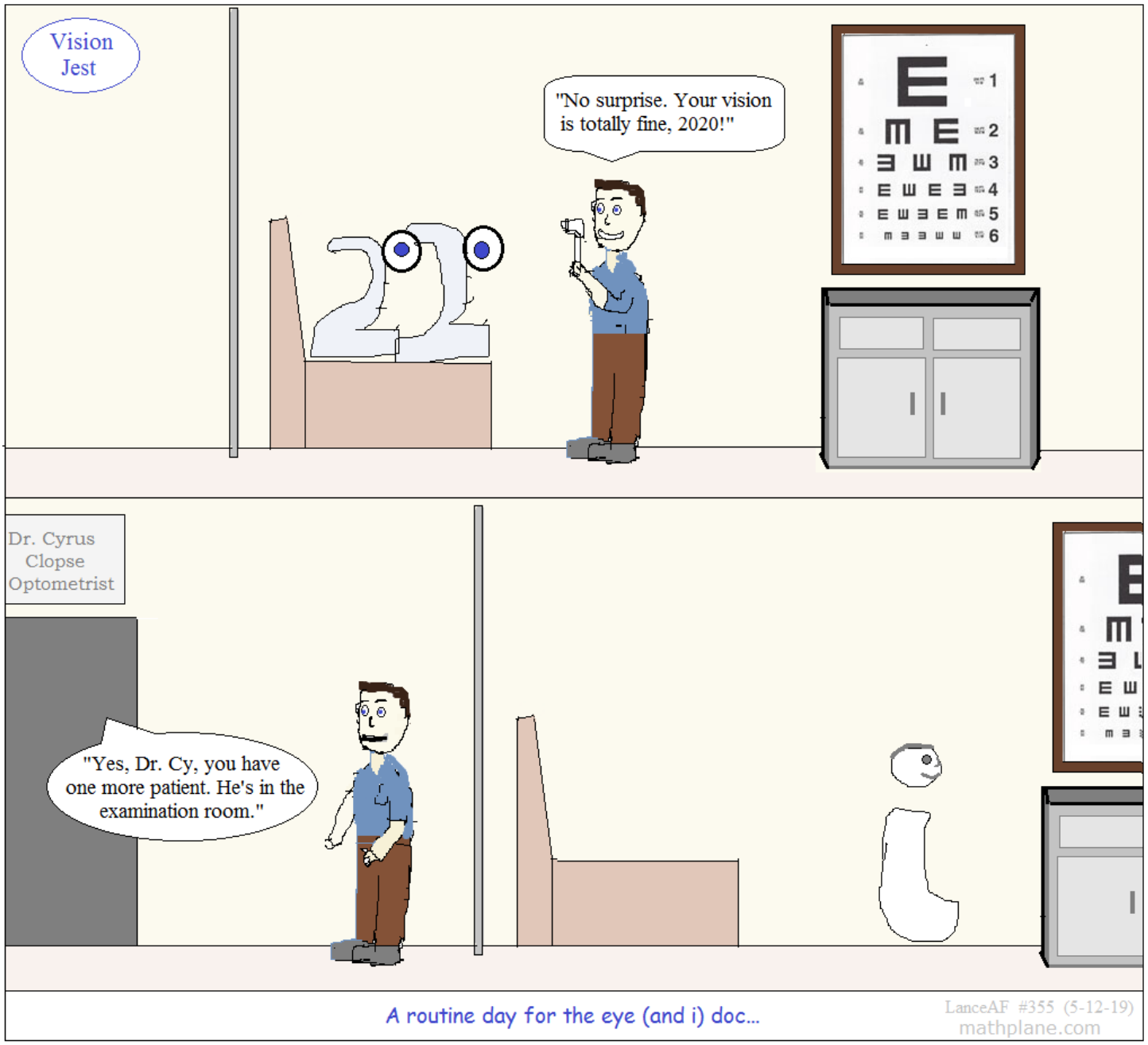
18) At 9:00 am, Danny goes out for his daily jog.
He runs due north at 7 miles per hour. Then, turns around and runs due south at a pace of 8 miles per hour.
If he returns to his starting spot at 9:50 am, how far did he run?

19) Mac wants to fill a fuel tank.
Pump 1 can fill a tank in 5 hours.
Pump 2 can fill a tank in 8 hours.

At 1:00 pm, Mac starts filling a tank with Pump 1.
Later in the afternoon, Pump 2 is available. So, Mac starts using it to fill the fuel tank.
(as he continues to use Pump 1. So, both are filling the tank.)

At 5:00, the fuel tank is full.

What time did Mac begin using Pump 2?


Vision Jest
"No surprise. Your vision is totally fine, 2020!"
Dr. Cyrus Clopse Optometrist
"Yes, Dr. Cy, you have one more patient. He's in the examination room."
A routine day for the eye (and i) doc...
LanceAF #355 (5-12-19)
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SOLUTIONS-→

Algebra 2 Review 006 Multiple Choice

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1) $7 > \frac{14}{x+1}$

a) $(-\infty, -1)$

b) $(-\infty, 1)$

c) $(1, \infty)$

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

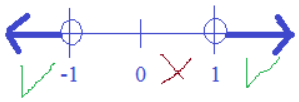
e) $(-1, 1)$

SOLUTIONS

First solve for x: $7 = \frac{14}{x+1}$ $\quad 7(x+1) = 14 \quad 7x = 7 \quad x = 1$

Then, recognize the vertical asymptote: x cannot equal -1

So, the critical values are -1 and 1



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

2) A rectangle has length 70 more than its width. If the length of a diagonal is 130, what is the perimeter of the rectangle?

a) 210

b) 300

c) 340

d) 400

e) 540

Pythagorean Theorem: $a^2 + b^2 = c^2$

$(x)^2 + (x+70)^2 = 130^2$

$x^2 + x^2 + 140x + 4900 = 16900$

$2x^2 + 140x - 12{,}000 = 0$

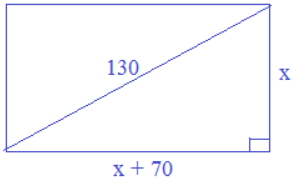
$x^2 + 70x - 6000 = 0$

$(x+120)(x-50) = 0$

$x = -120$ or 50

(length cannot be negative)

Perimeter = 2w + 21



Since x = 50, the lengths of the rectangle are 120.. and, the widths are 50...

Perimeter is 340

3) $\frac{\sqrt{10}}{\sqrt{2}+\sqrt{5}} =$

(rationalize the denominator; multiply by the conjugate)

a) $\frac{\sqrt{30}}{3}$

b) $\sqrt{5} - \sqrt{2}$

c) $\frac{5\sqrt{2} - 2\sqrt{5}}{3}$

d) $\frac{\sqrt{20} + \sqrt{50}}{7}$

e) $\frac{1}{\sqrt{5}+\sqrt{2}}$

$\frac{\sqrt{10}}{\sqrt{2}+\sqrt{5}} \cdot \frac{\sqrt{2}-\sqrt{5}}{\sqrt{2}-\sqrt{5}}$

$\frac{\sqrt{20} - \sqrt{50}}{2 + \sqrt{10} - \sqrt{10} - 5}$

$\frac{2\sqrt{5} - 5\sqrt{2}}{-3}$ (-1) (-1)

$\frac{-2\sqrt{5} + 5\sqrt{2}}{3}$

4) Solve $x^3 - 11x^2 + 31x = 21$

The SUM of the solutions is

a) 3

b) 7

c) 11

d) 14

e) 17

$x^3 - 11x^2 + 31x - 21 = 0$

since f(1) = 0, 1 is a root.. (x − 1) is a factor

1	1	-11	31	-21
		1	-10	21
	1	-10	21	0

$x^2 - 10x + 21$ → $(x-3)(x-7)$

$(x-1)(x-3)(x-7) = 0$

$x = 1, 3, 7$

the sum is $1 + 3 + 7 = 11$

Algebra 2 Review 006 Multiple Choice

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5) $f(x) = 4x - \frac{3}{\sqrt{x+1}}$ What is the domain?

SOLUTIONS

a) x = -1

b) x > -1

c) x > 1

d) x < -1

e) x > 0

denominator cannot be 0, so $x + 1 \neq 0$

numbers under a radical cannot be negative, so $x + 1 \not< 0$

domain is $x > -1$

6) $\frac{3}{4} - x^{-1} = 2x^{-1}$

a) -2

b) -1

c) 1

d) 2

e) 4

$\frac{3}{4} - \frac{1}{x} = \frac{2}{x}$

$\frac{3}{4} = \frac{3}{x}$

$x = 4$

7) Is $f(x) = x^5 + 7x^3 + 8$ odd, even, or neither?

a) odd

b) even

c) neither

Even: If $f(x) = f(-x)$ $f(-x) = -x^5 - 7x^3 + 8$ NOT equal to f(x)

Odd: If $f(-x) = -f(x)$ $-f(x) = -x^5 - 7x^3 - 8$ NOT equal to -f(x)

Neither

8) If wheel A makes 10 revolutions, how many revolutions will wheel C make?

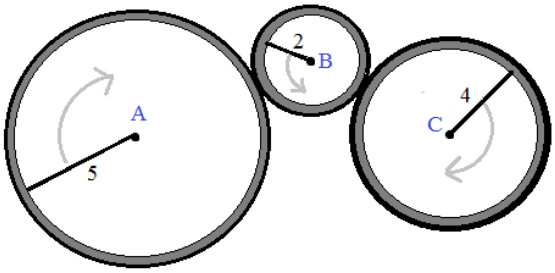
a) 6

b) 7.5

c) 8

d) 10

e) 12.5



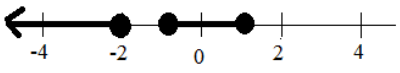
A 10 revolutions: 100 teeth (linear distance)

B 100 teeth (25 revolutions)

C 100 teeth → $\frac{100 \text{ teeth}}{8 \text{ teeth}}$ = 12.5 revolutions

9) $2x^3 + 4x^2 - 3x - 6 < 0$ Which is the best solution?

a)



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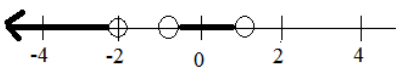

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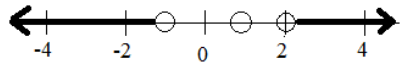
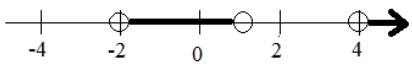
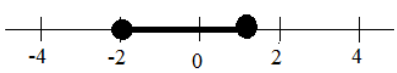


d)



e)

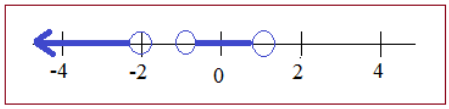


$2x^2(x + 2) - 3(x + 2) < 0$

$(2x^2 - 3)(x + 2) < 0$

critical values are $-2, -\frac{\sqrt{6}}{2}, \frac{\sqrt{6}}{2}$

-2, -1.22, 1.22 (approx)



Simplify the following:

SOLUTIONS

1) $\frac{3}{x^2} + \frac{4}{x} =$

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

$\boxed{\frac{4x+3}{x^2}}$

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

$\frac{4}{(x+1)(x+3)} - \frac{1}{(x+3)} =$

$\frac{4}{(x+1)(x+3)} - \frac{(x+1)}{(x+1)(x+3)} =$

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

3) $\frac{x^2-25}{x^2-4x} \cdot \frac{x^2+x-20}{x^2+10x+25}$

Factor the polynomials: $\frac{(x+5)(x-5)}{x(x-4)} \cdot \frac{(x+5)(x-4)}{(x+5)(x+5)}$

Cancel terms: $\frac{\cancel{(x+5)}(x-5)}{x\cancel{(x-4)}} \cdot \frac{\cancel{(x+5)}\cancel{(x-4)}}{\cancel{(x+5)}(x+5)}$

Combine: $\boxed{\frac{x-5}{x}}$

4) $\dfrac{\frac{x^2+3x+2}{x^2-1}}{\frac{4x^2+8x}{5(x-1)}}$ note: this is simply a division problem.

Invert and multiply: $\frac{x^2+3x+2}{x^2-1} \cdot \frac{5(x-1)}{4x^2+8x}$

factor: $\frac{(x+2)(x+1)}{(x+1)(x-1)} \cdot \frac{5(x-1)}{4x(x+2)}$

cancel: $\frac{\cancel{(x+2)}\cancel{(x+1)}}{\cancel{(x+1)}\cancel{(x-1)}} \cdot \frac{5\cancel{(x-1)}}{4x\cancel{(x+2)}}$

combine: $\boxed{\frac{5}{4x}}$

5) $\left(\frac{x^2+5x+4}{x^2+2x-8}\right) \div \left(\frac{3x^2+x-2}{x^2-4}\right) =$

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

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

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

6) factor $16x^3 + 250$

Greatest common factor is 2

$2 \cdot (8x^3 + 125)$

"A" = 2x "B" = 5

$\boxed{2\,(2x+5)(4x^2-10x+25)}$

don't forget the 2

7) $\dfrac{\frac{x}{y} - \frac{y}{x}}{\frac{1}{x^2} - \frac{1}{y^2}}$

step 1: combine numerator $\frac{x^2-y^2}{xy}$

step 2: combine denominator $\frac{y^2-x^2}{x^2y^2}$

step 3: divide $\frac{x^2-y^2}{xy} \div \frac{y^2-x^2}{x^2y^2}$

$\frac{x^2-y^2}{xy} \cdot \frac{x^2y^2}{y^2-x^2}$

$\frac{x^2-y^2}{\cancel{xy}} \cdot \frac{\cancel{x^2}\cancel{y^2}}{y^2-x^2}$

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

$\frac{x^2-y^2}{1} \cdot \frac{xy}{(x^2-y^2)(-1)}$

$\boxed{-xy}$

Algebra 2 (honors) Practice Test

SOLUTIONS

Solve:

1) $2 + \frac{x}{x+5} = 0$

$\frac{2(x+5)}{(x+5)} + \frac{x}{x+5}$ (common denominator)

$\frac{2x+10 \ + x}{x+5}$ (distribute and add fractions)

$0 = \frac{3x+10}{x+5}$ (collect "like" terms)

$x = -10/3$

2) $\frac{11}{3x} - \frac{1}{3} = \frac{-4}{x^2}$ combine terms on left side of equation

$\frac{11}{3x} - \frac{x}{3x} = \frac{-4}{x^2}$

$\frac{11 - x}{3x} = \frac{-4}{x^2}$ cross multiply

$-12x = -x^3 + 11x^2$

$x^3 - 11x^2 - 12x = 0$ factor/solve

$x(x-12)(x+1) = 0$

$x = 0, 12, -1$ check solutions!!

0: extraneous (because undefined)

12: $\frac{11}{36} - \frac{1}{3} = \frac{-4}{144}$

$\frac{-1}{36} = \frac{-1}{36}$ ✓

-1: $\frac{11}{-3} - \frac{1}{3} = \frac{-4}{1}$ ✓

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

Separate the radicals. Then, square both sides!

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

$x = (1+\sqrt{x-5})(1+\sqrt{x-5})$

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

Collect "like" terms and isolate the radical

$4 = 2\sqrt{x-5}$

Square both sides again

$16 = 4(x-5)$

$4 = x - 5$

$x = 9$

Check answer

$\sqrt{(9)} - \sqrt{(9)-5} = 1$

$3 - 2 = 1$ ✓

9 is the solution

Solve:

4) $3x^3 + 15x^2 = 0$

$3x^2(x+5) = 0$

$x = -5, 0$

5) $9x^3 + 36x^2 - x = 4$

$9x^3 + 36x^2 - x - 4 = 0$ (factor by grouping)

$9x^2(x+4) + (-1)(x+4) = 0$

$(9x^2 - 1)(x+4) = 0$

$(3x+1)(3x-1)(x+4) = 0$

$x = -4, \frac{1}{3}, \frac{-1}{3}$

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

GCF $x(x-2) \cdot [x + (x-2)] = 0$

$x(x-2)(2x-2) = 0$

$x = 0, 1, 2$

Simplify:

7) $x^{-3/2} - 2x^{-1/2} + x^{1/2}$ (factor out the lowest exponent)

$x^{-3/2}(1 - 2x + x^2)$ (factor the quadratic)

$x^{-3/2}(x-1)(x-1)$

$x^{-3/2}(x-1)^2$

8) $64m^2 - n^2 - 4 + 4n$

$64m^2 - (n^2 + 4 - 4n)$

$64m^2 - (n-2)(n-2)$

$64m^2 - (n-2)^2$

difference of squares

$(8m + (n-2))(8m - (n-2))$

$(8m + n - 2)(8m - n + 2)$

***Challenge 9) $x^4 - 19x^2 + 9$

$x^4 + 6x^2 + 9 - 25x^2$

$(x^2+3)(x^2+3) - 25x^2$

$(x^2+3)^2 - 25x^2$

difference of squares

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

Algebra 2 (honors) Practice Test

SOLUTIONS

Solve by Completing the Square:

10) $x^2 + 4x = 7$

$x^2 + 4x + 4 = 7 + 4$ add $\left(\frac{b}{2}\right)^2$ to both sides

$(x + 2)(x + 2) = 11$

$\sqrt{(x + 2)^2} = 11$

$(x + 2) = \pm\sqrt{11}$

$x = -2 \pm \sqrt{11}$

11) $-2x^2 + 9x + 3 = 0$

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

$-2(x^2 - \frac{9}{2}x + \frac{81}{16}) = -3 + \frac{81}{16}(-2)$

$-2(x + \frac{9}{4})^2 = \frac{-105}{8}$

$(x + \frac{9}{4})^2 = \frac{105}{16}$

$x + \frac{9}{4} = \pm\frac{\sqrt{105}}{4}$

$x = \frac{9}{4} \pm \frac{\sqrt{105}}{4}$

Solve using the Quadratic Formula:

12) $2x^2 + 8x = -4$

$2x^2 + 8x + 4 = 0$

$a = 2$
$b = 8$
$c = 4$

$x = \frac{-(8) \pm \sqrt{(8)^2 - 4(2)(4)}}{2(2)}$

$x = \frac{-8 \pm \sqrt{32}}{4}$

$x = -2 \pm \sqrt{2}$

Fill in the blanks:

13) $(x + \underline{4})^2 = x^2 + 8x + \underline{16}$

14) $(x + \underline{7})^2 + \underline{(-40)} = x^2 + 14x + 9$

15) $3x^2 - 30x + 68 = 3(x^2 - \underline{10}x + \underline{25}) + \underline{-75} + 68 = 3(x - \underline{5})^2 + \underline{-7}$

Algebra 2 (honors) Practice Test

SOLUTIONS

16) If Jim can paint a fence in 6 hours, and Tim can paint a fence in 4 hours.
How long will it take them to paint a fence *working together*?

-1: $\frac{11}{-3} - \frac{1}{3} = \frac{-4}{1}$ ✓

amount of fence = (rate)(time)

therefore, $\text{rate} = \frac{\text{fence}}{\text{time}}$

Jim's rate: $\text{rate}_J = \frac{1 \text{ fence}}{6 \text{ hours}}$

Tim's rate: $\text{rate}_T = \frac{1 \text{ fence}}{4 \text{ hours}}$

Working together:

Jim's amount + Tim's amount = 1 fence

$\text{rate}_J\,(t) + \text{rate}_T\,(t) = 1 \text{ fence}$

$\frac{1 \text{ fence}}{6 \text{ hours}}(t) + \frac{1 \text{ fence}}{4 \text{ hours}}(t) = 1 \text{ fence}$

Solve (multiply by 24 hours; divide by fence)

$4t + 6t = 24 \text{ hours}$

$t = 12/5 \text{ hours}$ (2 hours, 24 minutes)

Check:

Jim: (1/6)(12/5) = 2/5

Tim: (1/4)(12/5) = 3/5

total: 5/5 ✓

17) A girl can wash the windows in 45 minutes.
Working with her brother, they can wash the windows in 20 minutes.

Working by himself, how fast can the brother wash the windows?

girl brother

$1 = \frac{1}{45}t + \frac{1}{x}t$

let t = 20 minutes

$1 = \frac{20}{45} + \frac{20}{x}$

$\frac{25}{45} = \frac{20}{x}$ $\quad x = 36$

18) At 9:00 am, Danny goes out for his daily jog.
He runs due north at 7 miles per hour. Then, turns around and runs due south at a pace of 8 miles per hour.
If he returns to his starting spot at 9:50 am, how far did he run?

distance = (rate)(time)

North: distance = $(\frac{7 \text{ miles}}{60 \text{ minutes}})$(time)

$d_N = \frac{7 \text{ miles}}{60 \text{ min.}}\,(t)$

South: distance = $(\frac{8 \text{ miles}}{60 \text{ minutes}})$(time)

$d_S = \frac{8 \text{ miles}}{60 \text{ min.}}\,(50 \text{ min.} - t)$

Since the distance north is the same as the distance south,
we set the equations equal to each other...

$\frac{7 \text{ miles}}{60 \text{ min.}}\,(t) = \frac{8 \text{ miles}}{60 \text{ min.}}\,(50 \text{ min} - t)$

(units cancel)

$\frac{7}{60}t = \frac{400 \text{ min}}{60} - \frac{8}{60}t$

(multiply by 60; then, collect 'like' terms)

$15t = 400 \text{ minutes}$

$t = 26\ 2/3 \text{ minutes}$

therefore, Danny runs 26 2/3 minutes North
and runs 23 1/3 minutes South...

distance north = (26 2/3)(7/60) = 3.11 miles
distance south = (23 1/3)(8/60) = 3.11 miles

total: 6.22 miles

19) Mac wants to fill a fuel tank.
Pump 1 can fill a tank in 5 hours.
Pump 2 can fill a tank in 8 hours.

At 1:00 pm, Mac starts filling a tank with Pump 1.
Later in the afternoon, Pump 2 is available. So, Mac starts using it to fill the fuel tank.
(as he continues to use Pump 1. So, both are filling the tank.)

At 5:00, the fuel tank is full.

What time did Mac begin using Pump 2?

$\frac{1 \text{ tank}}{5 \text{ hours}}(4 \text{ hours}) + \frac{1 \text{ tank}}{8 \text{ hours}}(t) = 1 \text{ tank}$

$\frac{4}{5}(\text{tank}) + \frac{1 \text{ tank}}{8}(\text{time}) = 1 \text{ tank}$

$\frac{4}{5} + \frac{1}{8}t = 1$

$\frac{5t}{40} = \frac{8}{40}$ $\quad t = 1.6 \text{ hours}$ (1 hr. 36 min)

3:24 PM, Pump 2 began...

LanceAF #326 (7-30-18)
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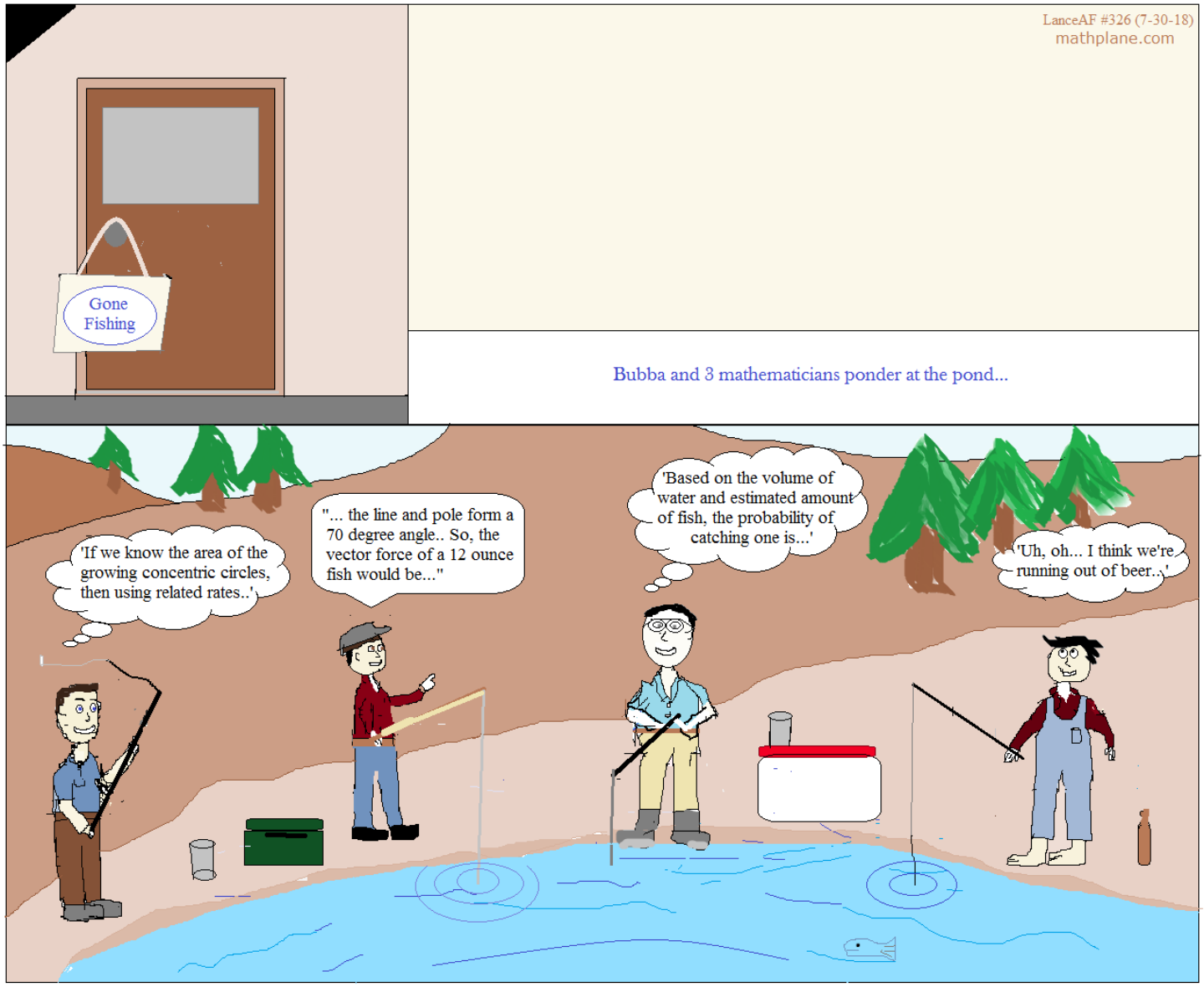
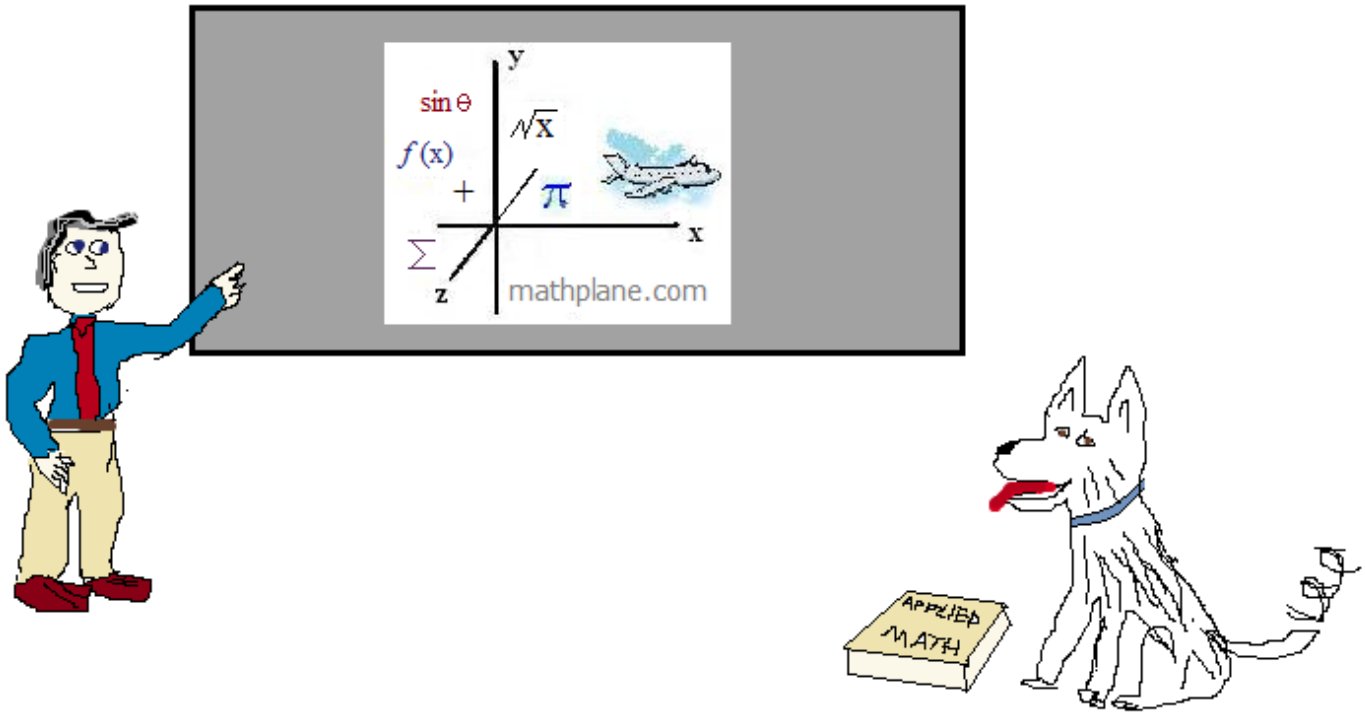


Bubba and 3 mathematicians ponder at the pond...

Thanks for visiting.
Hope the review helped!
If you have questions, suggestions, or requests, let us know.



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