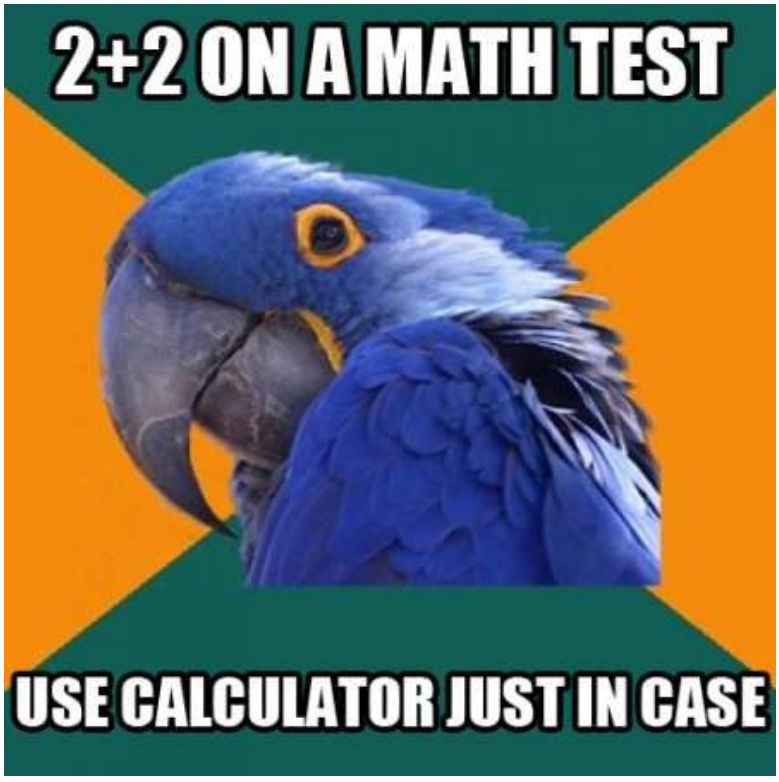
NAME _____

FOM 3
Final Exam Review

1st period: January 11 AM
2nd period: January 11 PM
3rd period: January 14 AM



Unit 1 Bare Necessities - Quadratics and Piecewise

Simplifying Radicals

1. If the number is negative, cross out the negative and bring out *i*.
2. Make factor tree.
3. Cross out a group and bring that number out of the radical (no group = stays in)
4. Multiply together numbers that came out of the radical and numbers that stayed in

All Together!!

EX1. $\sqrt{20}$

EX2. $\sqrt{-600}$

You Try!!

1. $\sqrt{1500}$

2. $\sqrt{-12}$

3. $\sqrt{405}$

4. $\sqrt{-80}$

5. $\sqrt{-76}$

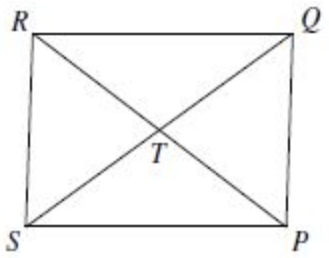
6. $\sqrt{-7}$

Parallelograms & Properties

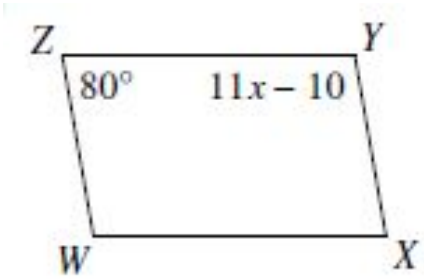
- Opposite sides are congruent
- Opposite angles are congruent
- Consecutive angles are supplementary
- Diagonals bisect each other

All Together!!

EX 8. Find x given $RP = 48$ and $RT = 3x - 5$

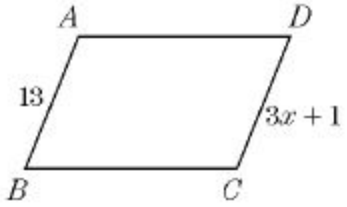


EX 9. Solve for x

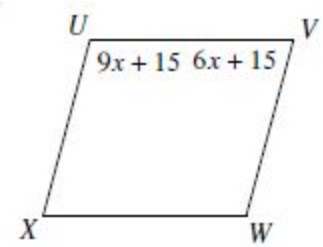


You Try!!

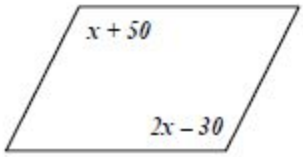
12. Solve for x.



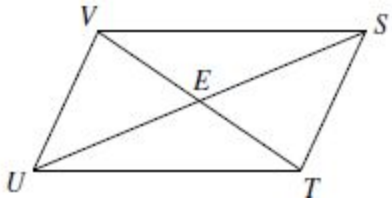
13. Find the $m < U$



14. Solve for x.



15. Solve for TE given $TE = 4 + 2x$ and $EV = 4x - 4$

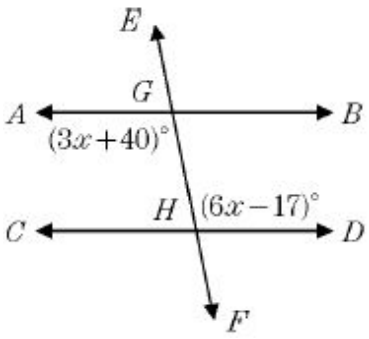


Parallel Line Relationships

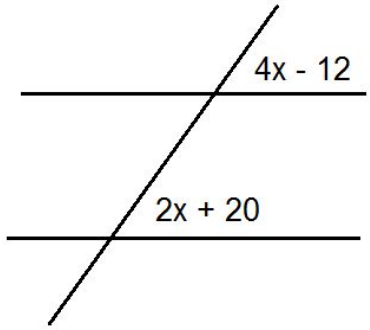
1. Identify the type of angles
2. Decide if they are congruent or supplementary
3. Solve the equation

All Together!!

EX6.

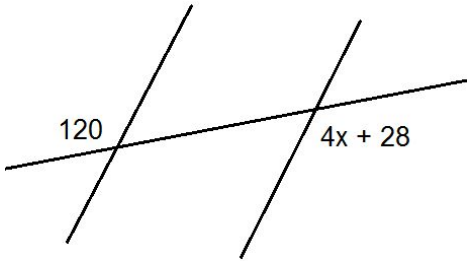


EX7.



You Try!!

9.



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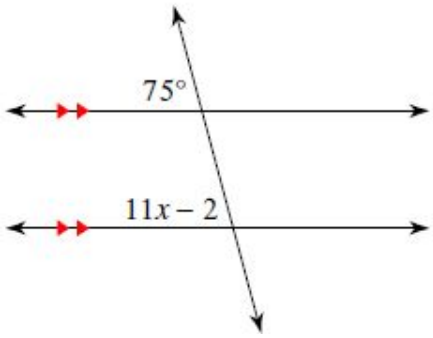

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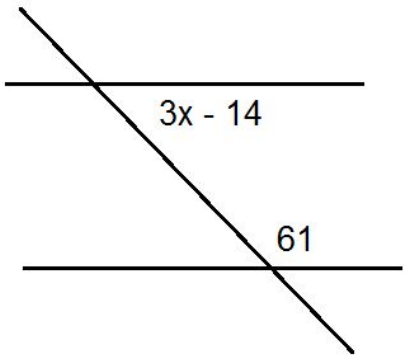


Solving Quadratic Equations Using the Quadratic Formula

$ax^2 + bx + c = 0$

**must be equal to zero
**helpful if a is positive

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

All Together!!

EX3. $m^2 - 5m - 14 = 0$

EX4. $x^2 - 4x = -9$

EX5. $8n^2 - 18 = 4n$

You Try!!

7. $8a^2 + 6a = -5$

8. $2k^2 - 7k - 13 = -10$

9. $2x^2 - 3x - 5 = 0$

10. $h^2 = 9h - 20$

11. $2x^2 + 4x + 3 = 0$

12. $9b^2 - 6b - 3 = 8$

Vertex of a Parabola

1. Find x by using the formula $x = \frac{-b}{2a}$.
2. Substitute x value in to find y value.
3. Write as a point.

All Together!!

EX6. $y = 2x^2 + 10x - 4$

You Try!!

13. $y = 3x^2 - 12x + 5$

14. $y = -x^2 + 2x + 3$

15. $y = -2x^2 - 16x - 35$

16. $y = 3x^2 + 24x + 49$

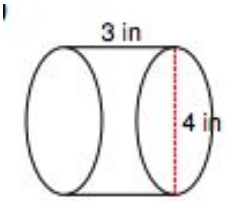
Volume

1. Find the area of the base
2. Multiply by the height
3. Be sure to a label of cubed units!

** The volume of cones and pyramids must be divided by 3 (same as multiplied by $\frac{1}{3}$)
** Volume of a sphere has a special formula $V = \frac{4}{3}\pi r^3$

All Together!!

EX4.



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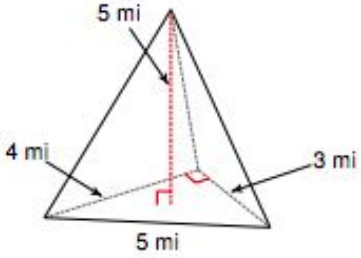
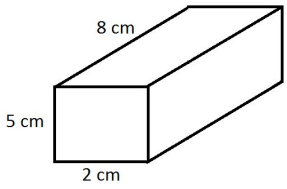


You Try!!

5.



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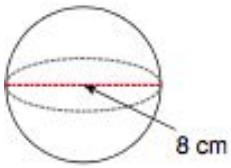

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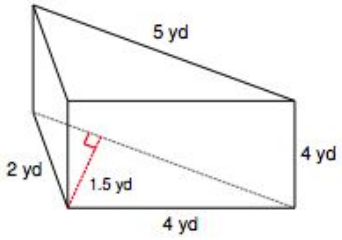

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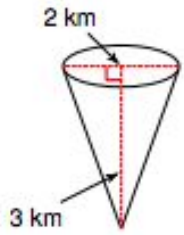


Unit 8 Bare Necessities - Geometry

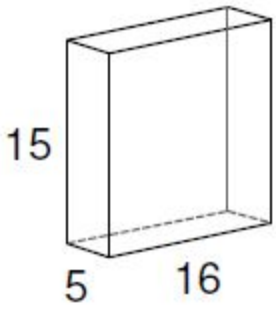
Surface Area

1. Find the area of the different shapes that make up the 3D figure.
2. Add the areas of all faces
3. Be sure to include a label of squared units!

**Surface area of a sphere has a special formula $SA = 4\pi r^2$

All Together!!

EX1.



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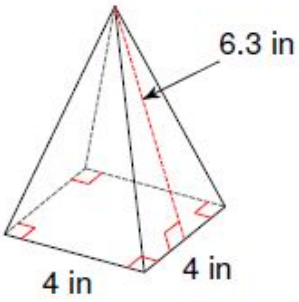

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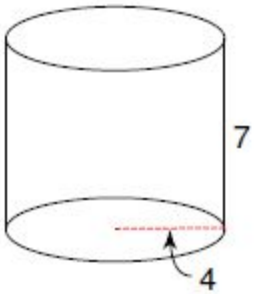
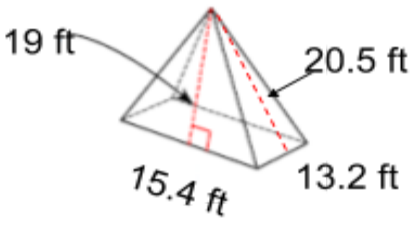


You Try!!

1.



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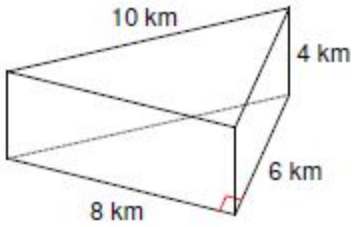
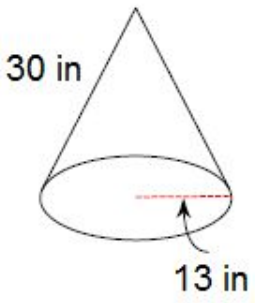


3.

4.



Evaluate Piecewise Functions

1. Use the inequalities to determine which piece to use.
2. Substitute in the number for x.

All Together!!

$$f(x) = \begin{cases} 3x - 9, x < -3 \\ 8x^2, x \geq -3 \end{cases}$$

EX7. $f(8)$ EX8. $f(-10)$ EX9. $f(-3)$ EX10. $f(-1)$

You Try!!

$$g(x) = \begin{cases} 9 - x, x \leq 2 \\ 3x + 1, x > 2 \end{cases}$$

17. $g(1)$ 18. $g(9)$ 19. $g(2)$

20. $g(0)$ 21. $g(-3)$ 22. $g(17)$

Unit 2 Bare Necessities - Polynomials

Operations with Polynomials

To add or subtract polynomials:

1. Put a 1 in front of second parenthesis and distribute it
2. Combine any like terms (do not change the exponents!!)

To multiply polynomials:

1. Distribute or FOIL as needed
2. Multiply the numbers in front and add the exponents
3. Combine any like terms (do not change the exponents!!)

All Together!!

EX1. $(7x^4 - 7x^2 - 8) + (7x - 8 - 8x^4)$

EX2. $(p^4 - 4p^3 - 8p) - (-7p^4 - 5p^3 + 7p)$

EX3. $(6x - 3)(2x + 5)$

You Try!!

1. $5xy^2(4x^2y + 8xy - 2y)$

2. $(5y - 7)(2y + 2)$

3. $(5h^3 - 2h + 3) - (8h^3 + 6h^2 - h - 2)$

4. $(f + 3)(f^2 + 2f - 6)$

5. $(3k + 7)^2$

6. $(7g^3 + 4g^2 - 9g) + (8g - 6g^3 - 4g^2)$

Equations of Sine and Cosine

$y = a \cdot sin(bx) + d$ amplitude = $|a|$

period = $\frac{2\pi}{b}$

$y = a \cdot cos(bx) + d$ vertical shift = +d up, −d down

All Together!!

EX10. $y = -3cos6x + 2$

You Try!!

20. $y = sin5x - 3$

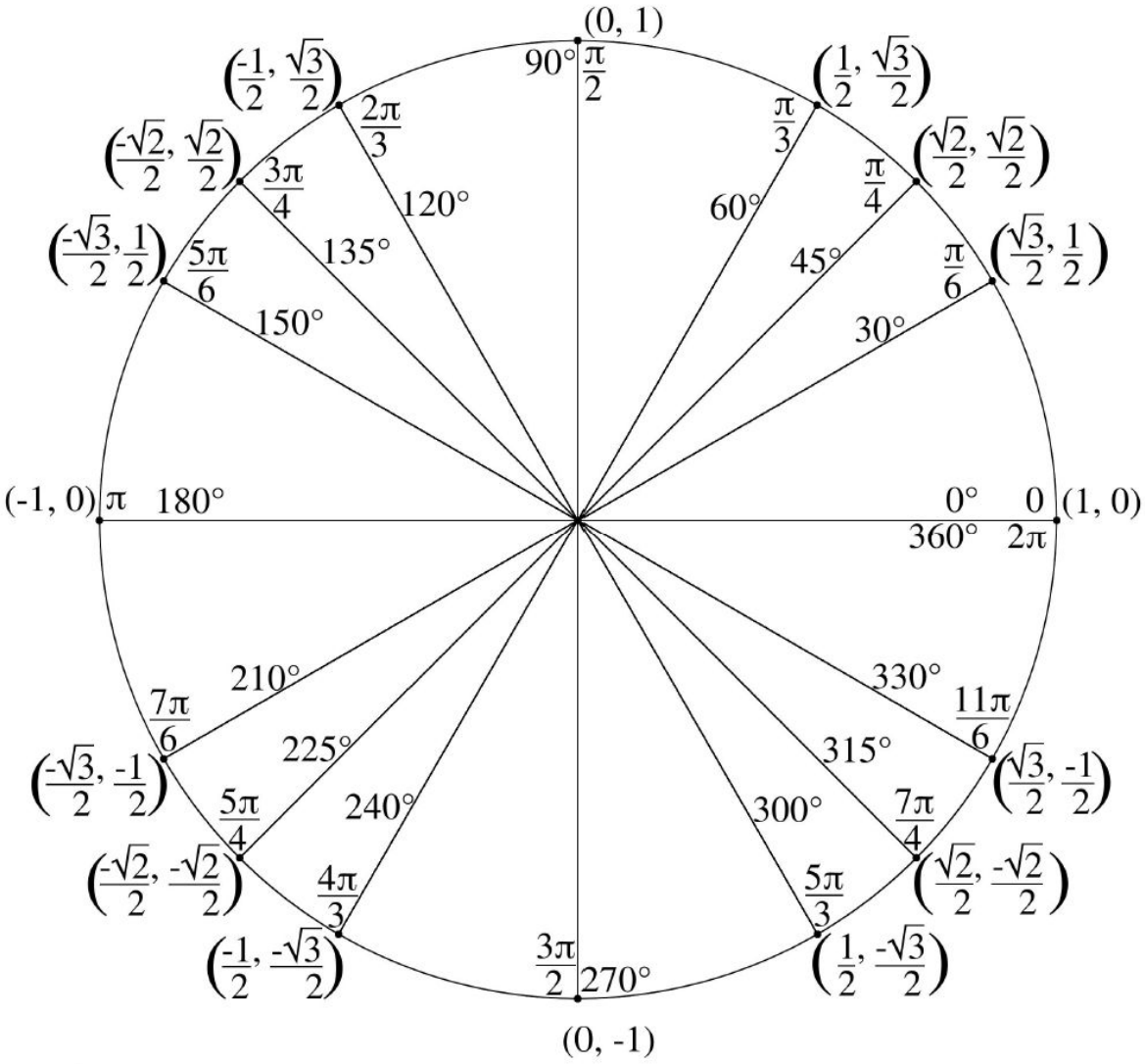
21. $y = -3sin\frac{1}{4}x + 10$

22. $y = 2cosx$

23. $y = -5sin4x - 3$

Exact Values of Trig Ratios

cosine = x-coordinate sine = y-coordinate tangent = y ÷ x



All together!!

EX7. $sin300^o$ EX8. $cos-225^o$ EX9. $tan120^o$

You try!!

14. $cos210^o$ 15. $sin765^o$ 16. $tan240^o$

17. $sin180^o$ 18. $tan-225^o$ 19. $cos300^o$

Synthetic Division

1. Make sure terms are in order. Make sure you have every term down from the highest power.
2. Set binomial you are dividing by equal to zero and solve for x. That number goes in the box.
3. Line up coefficients next to box
4. Add to get below the line.
5. Multiply with box to get back above the line.
6. Answer starts one power less than highest power in original problem.

All Together!!

EX5. $(3x^2 + 4x - 12) \div (x + 5)$

EX6. $(x^4 - 3x^2 + 2x + 12) \div (x + 1)$

You Try!!

7. $(x^2 - 5x - 12) \div (x - 3)$

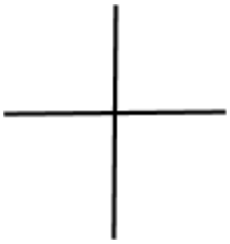
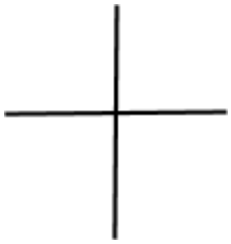
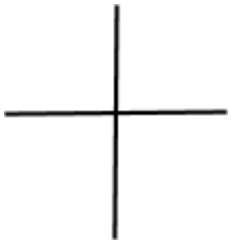
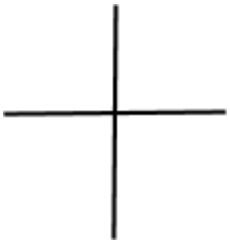
8. $(6x^4 + 4x^3 - x^2 + 9) \div (x + 1)$

9. $(-10x^2 + 3x^3 + x - 5) \div (x + 4)$

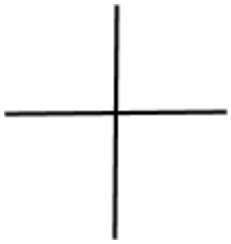
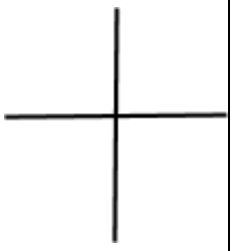
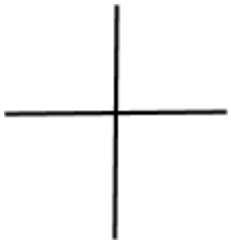
10. $(x^3 - 3x^2 - 13x - 30) \div (x - 6)$

Zeroes, Multiplicity, and End Behavior

End Behavior:

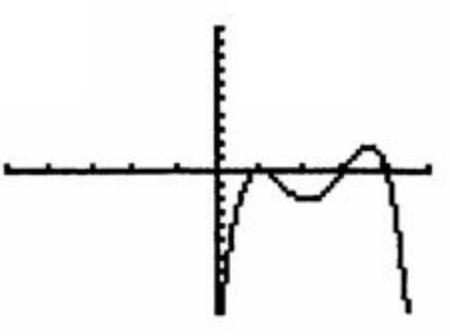
	even exponent	odd exponent
positive coefficient		
negative coefficient		

Zeroes and Multiplicity:

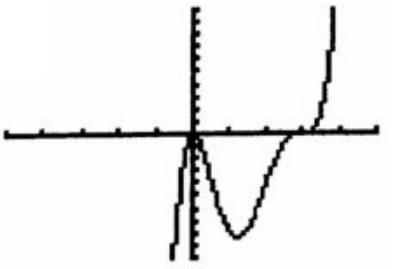
All Together!!

EX4.



You Try!!

11.



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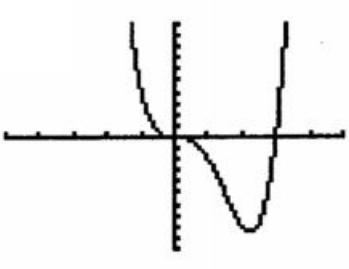

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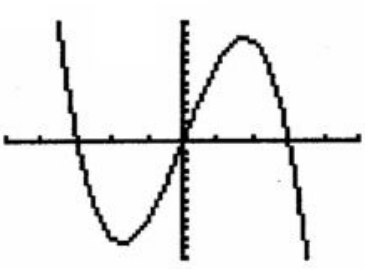


Convert Between Radians and Degrees

**conversion factor: 180° = π radians

All Together!!

EX3. Convert to degrees: $\frac{3\pi}{8}$

EX4. Convert to radians: 400°

You Try!!

Convert to degrees.

5. $\frac{\pi}{9}$

6. $\frac{7\pi}{3}$

7. 5π

Convert to radians.

8. 125°

9. 90°

10. 390°

Coterminal Angles

** +/− 360° if in degrees

All Together!!

EX5. 1270°

EX6. $-\frac{12\pi}{5}$

You Try!!

Give the coterminal angle between 0^o *and* 360^o.

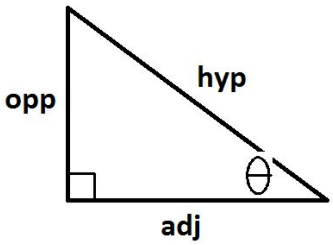
11. −620°

12. $\frac{9\pi}{4}$

13. 4000°

Unit 7 Bare Necessities - Trig

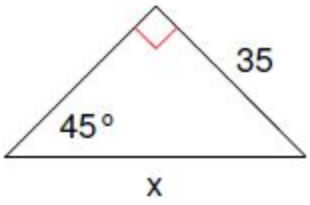
Right Triangle Trig



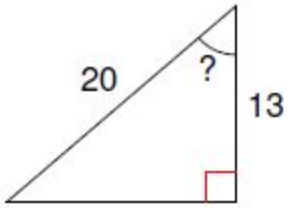
$sin\ \theta = \frac{opp}{hyp}$ $cos\ \theta = \frac{adj}{hyp}$ $tan\ \theta = \frac{opp}{adj}$

All Together!!

EX1.

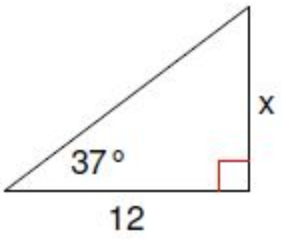


EX2.

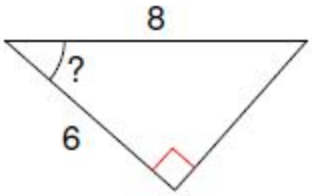


You Try!!

1.



2.



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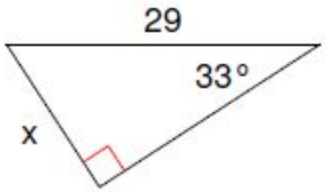

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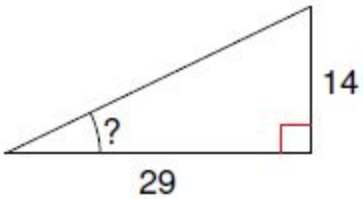


Extrema, Intervals for Increasing and Decreasing

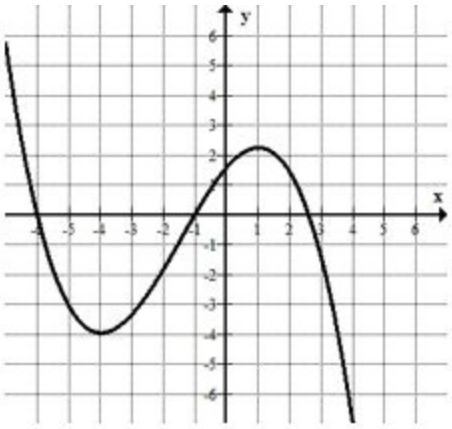
Extrema are “turning points”

Intervals are named using the x-values only! Ignore the y-values!

- increasing - on a path going up
- decreasing - on a path going down

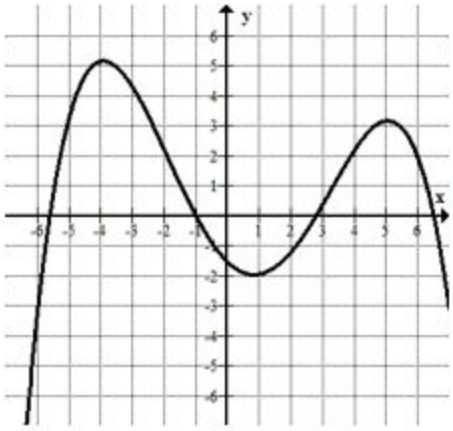
All Together!!

EX5.



You Try!!

14.



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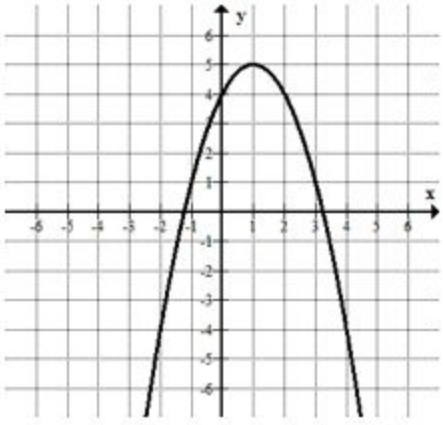

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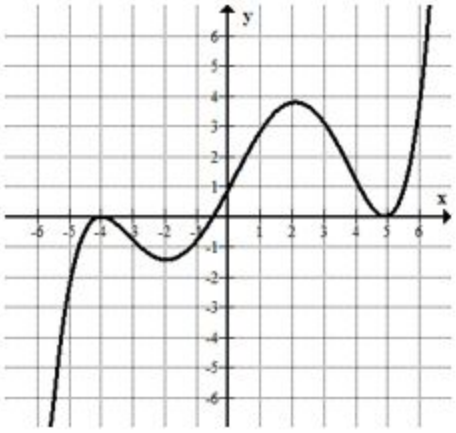


Unit 3 Bare Necessities - Factoring

Factor Using GCF

Find the largest term that divides every term in the polynomial and divide it out.
**Always look for it before doing anything else on factoring problem!

All Together!!

EX1. $45x^2 - 25x$

EX2. $-18a^5b^4c + 12a^4b^2c^2 - 30a^3b^2$

You Try!!

1. $21w^3 - 35w$

2. $-24x^6 - 4x^4 + 12x^3 + 8x^2$

Factor Difference of Squares

$a^2 - b^2 = (a + b)(a - b)$

All Together!!

EX3. $h^2 - 100$

You Try!!

3. $9x^2 - 64$

4. $2x^2 - 50$

Equation of a Circle

$(x-h)^2+(y-k)^2=r^2$ center: (h,k)

radius: r

All Together!!

EX5. $(x-3)^2+(y-5)^2=81$

EX6. $x^2+y^2+12x-4y+31=0$

You Try!!

Determine the center and radius.

13. $(x+4)^2+(y-8)^2=144$

14. $x^2+(y+7)^2=1$

15. $x^2+y^2+16x+2y+16=0$

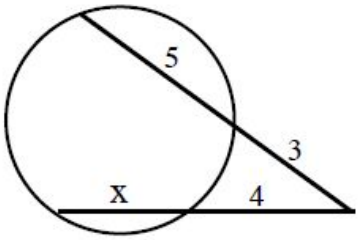
16. $x^2+y^2-6x+8y-11=0$

Lengths with Circles

outside • whole length = outside • whole length *one piece • other = one piece • other*

All together!!

EX3.



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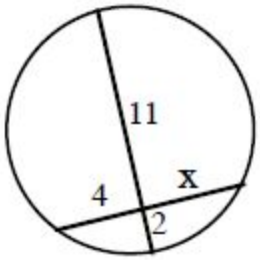
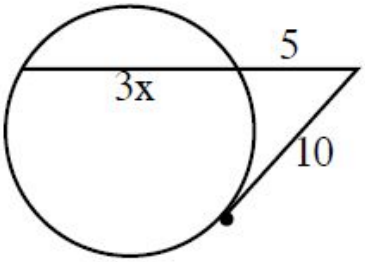


You try!!

7.



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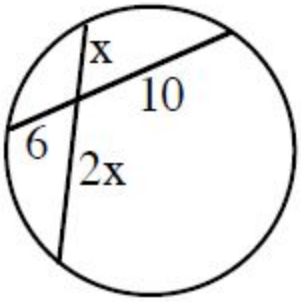

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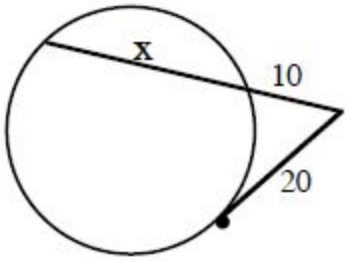

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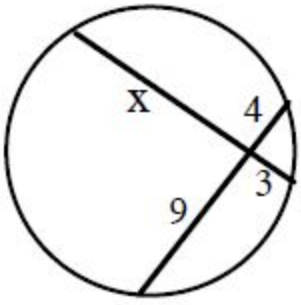

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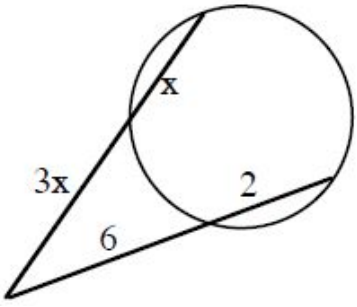

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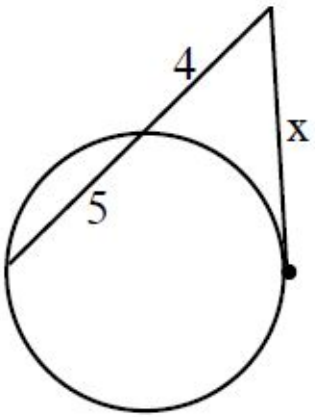


Factor Trinomials

- first term times last term
- find numbers that multiply to that but also add to middle term
- replace middle term with numbers
- split in half and factor GCF from both sides
- what is in parentheses must match, that is one factor and GCFs make other factor

All Together!!

EX 3. $g^2 + 5g - 24$

EX4. $6x^2 - 19x + 10$

You Try!!

5. $x^2 - x - 56$

6. $3x^2 + 4x - 15$

7. $n^2 + n - 42$

8. $2g^2 - 10g - 72$

Zeroes From Factors

To find zeroes from factors:

- set factors equal to zero and solve for x
- exponent of the factor is the multiplicity

To write factors from zeroes:

- work backwards to make factor equal to zero
- multiplicity is the exponent of the factor

All together!!

EX5. Find the zeroes of:
$f(x) = 3x(x-5)^4(x+2)$

EX6. Write the polynomial given zeroes:
$x = 5$ mult: 3, $x = -1$ mult:9, $x = 2$ mult: 1

You try!!
Find the zeroes and their multiplicities:

9. $f(x) = (x+8)^2(x-5)^2(x+1)$

10. $f(x) = 4(x+3)(2x-1)$

11. $f(x) = (x-300)^{95}$

12. $f(x) = -2x^2(x+5)(x+2)^4$

Write the polynomial using the given zeroes:

13. $x = -9$ mult: 3, $x = 2$ mult: 2

14. $x = 0$ mult: 5, $x = -1$ mult: 1, $x = -7$ mult: 1

Unit 6 Bare Necessities - Circles

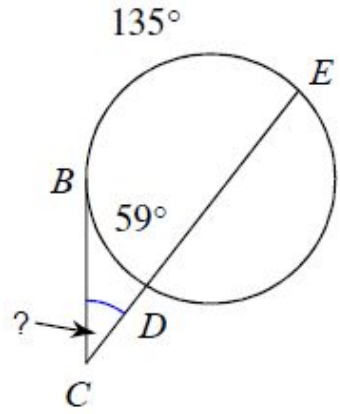
Arcs and Angles of Circles

$$angle = \frac{big\ arc - little\ arc}{2}$$

$$angle = \frac{arc + other\ arc}{2}$$

All together!!

EX1.



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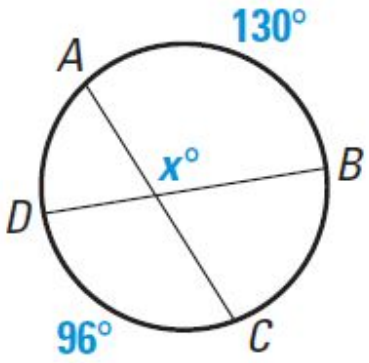
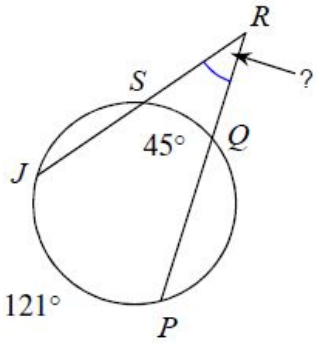


You try!!

1.



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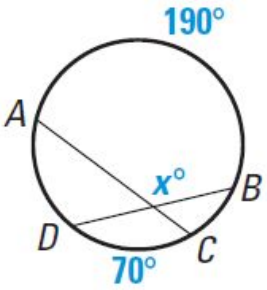

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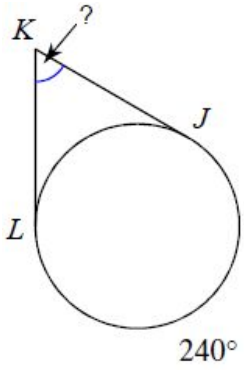

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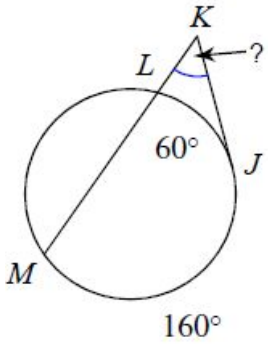

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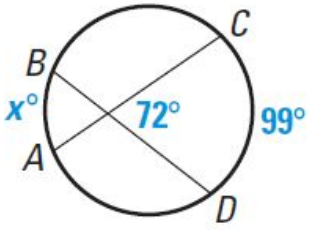

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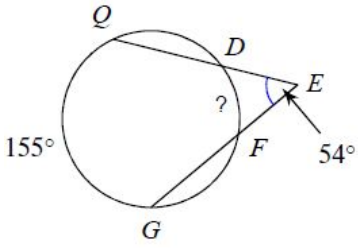

Asymptotes and Holes of Rational Functions

Factor, then cancel.

Look ONLY at the denominator!

- Factors that cancel create holes
- Factors that did not cancel create vertical asymptotes

Horizontal asymptotes:

- look for highest exponent in whole problem
- divide those terms

All Together!!

EX4. $f(x) = \frac{2x^2-x-15}{x^2+x-12} = \frac{(x-3)(2x+5)}{(x+4)(x-3)}$

EX5. $f(x) = \frac{x+7}{x^2-10x+21} = \frac{x+7}{(x-7)(x-3)}$

You Try!!

Determine the vertical asymptotes, holes, domain, and horizontal asymptotes.

7. $f(x) = \frac{2x^2-9x-5}{x^2+x-30} = \frac{(2x+1)(x-5)}{(x+6)(x-5)}$

8. $f(x) = \frac{x^2+5x+4}{x+4} = \frac{(x+4)(x+1)}{x+4}$

9. $f(x) = \frac{5x^2-27x-18}{5x^2+43x+24} = \frac{(x-6)(5x+3)}{(x+8)(5x+3)}$

10. $f(x) = \frac{x+6}{x^2+8x-9} = \frac{x+6}{(x-1)(x+9)}$

Unit 4 Bare Necessities - Exponents and Logarithms

Rewriting Exponents and Logarithms

logarithmic form: $log_3 9 = 2$

exponential form: $3^2 = 9$

All Together!!

EX1. Rewrite $6^3 = 216$ in logarithmic form.

EX2. Rewrite $log_2 16 = 4$ in exponential form.

You Try!!

Rewrite in logarithmic form.

1. $3^5 = 243$
2. $8^4 = 4096$

Rewrite in exponential form.

3. $log_5 125 = 3$
4. $log\ 100 = 2$

Solving Logarithmic Equations

1. apply a property if needed to write as one log
2. convert to exponential form
3. solve for x

Properties

* $log_b M + log_b N = log_b M \cdot N$
* $log_b M - log_b N = log_b \frac{M}{N}$
*If $log_b M = log_b N$, then $M = N$

All Together!!

EX3. $log_5 (3x + 11) = 4$

EX4. $log\ 6x - log\ 3 = 2$

You Try!!

5. $log_4 x = 3$
6. $log_3 8 + log_3 (x - 2) = 6$

7. $log_9(x+20) = log_9(3x-4)$

8. $log_7(3x+6) = 4$

Solving Exponential Equations

1. Take the natural log of both sides
2. bring exponent down in front of the log
3. solve for x

All Together!!

EX5. $5^x = 37$

EX6. $9^{7x-2} = 3$

You Try!!

9. $e^{6x} = 2.9$

10. $1.54^x = 28$

11. $4^{x+3} = 22$

12. $3.8^{2x-6} = 19.1$

Dividing Rational Expressions

Keep, change, flip. Factor, then cancel.

All Together!!

EX3. $\frac{x^2+9x+18}{x^2-9} \div \frac{x+6}{x-6}$

You Try!!

5. $\frac{x^2+2x-3}{x^2-5x+4} \div \frac{x^2-9}{x^2-2x-8}$

6. $\frac{3x-9}{x^2-x-20} \div \frac{x^2+2x-15}{x^2-25}$

Multiplying Rational Expressions

Factor, then cancel. **Remember, the factors can be in either fraction!!

All Together!!

EX2. $\frac{x}{x+3} \cdot \frac{x^2-5x-24}{x^2-5x}$

You Try!!

3. $\frac{x+3}{3x^2+4x-15} \cdot \frac{4x^2-9}{2x+3}$

4. $\frac{x-3}{x^2-4} \cdot \frac{x+2}{x^2-6x+9}$

Exponential Growth and Decay

y: final amount of whatever you are measuring

$y = a(b)^t$

a: initial amount
b: growth or decay factor ($1 + r$ for growth; $1 - r$ for decay)
t: number of time periods that pass

All Together!!

EX7. Ryan's motorcycle is now worth $2500. It has decreased in value 12% each year since it was purchased. If he bought it four years ago, what did it cost new?

You Try!!

13. According to a computer model, a population of salmon will decline each year by 6%. In 2015, there are currently 3000 salmon in the population. How many salmon are predicted to be in that population in 2025?

14. The half-life of a radioactive element is the time it takes for 50% of its atoms to decay. About how many grams of a radioactive element would remain from a sample of 20g after 3 half-lives?

15. Movie tickets now average $9.75 a ticket, but are increasing 15% per year. How much will they cost 5 years from now?

Compound Interest

Compounded over time:

A: final amount of money

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

P: initial amount of money
r: interest rate (as a decimal)
n: number of times compounded in a year
t: time (in years!)

Compounded continuously:

$$A = P e^{rt}$$

All Together!!

EX8. What amount will an account have after 18 years if $250 is invested at 5% interest compounded semiannually?

You Try!!

16. What amount invested at 9% interest compounded continuously for 4 years will yield $590?

17. If $800 is invested at 7% interest compounded continuously, how long will it take before the amount is $1100?

18. Determine the amount that must be invested at 4.5% interest compounded quarterly, so that $300,000 will be available for retirement in 15 years.

19. How long does it take $800 to double if it is invested at 5% interest compounded monthly?

Unit 5 Bare Necessities - Rational Expressions

Simplifying Rational Expressions

Factor, then cancel.

All Together!!

EX1. $\frac{x^2-16}{x^2+3x-28}$

You Try!!

1. $\frac{x^2-11x+18}{x^2+2x-8}$

2. $\frac{2x^2+10x-48}{8x+64}$