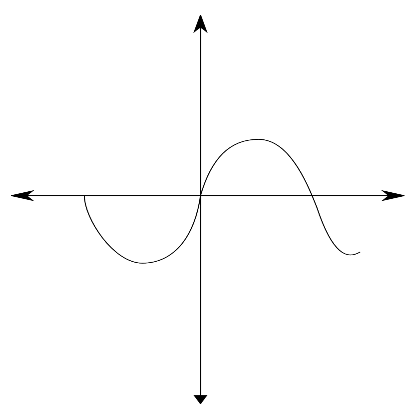
Mrs. Fortier's Advanced Functions Exam Review : 2008/2009

Polynomial Functions

1. If given one factor of a polynomial, find the other factor. Example: $x+3$ is a factor of x^3+5x^2-18 . Find another factor.
2. Solve inequalities and communicate answer in both set notation and interval notation, example: (x-2)(x+3)(x-4)>0.
3. Be able to find the remainder when two polynomial functions are divided. Find the remainder of x^4+3x^2+2 divided by $x-2$.
4. How many zeroes can each of the following functions have at most
   a) linear
   b) quatratic
   c) cubic
   d) quartic
   e) quintic
   f) polynomial of n degree
5. Understand the slope formula as an average rate of change in the following ways
   a) $m=\frac{y2-y1}{x2-x1}$ or
   b) $m=\frac{f(b)-f(a)}{b-a}$
6. Find the instantaneous rate of change of a polynomial function at a given point. Example: for x=3 for $f(x)=x+x^2$.
7. Factor complex sum or difference of cubes. Example: $\frac{1}{15625}x^3-3375y^3$.
8. Use the factor theorem and/or long division to solve appliacations of polynomial functions. (i.e. Box questions). Example: Given a topless box that is created by cutting out square of equal length/area from each corners of a piece of cardboard that **50cm by 30cm** and folding up the edges. Find the lengths of the squares to be cut so that the volume of the box is **3168cm^2**. (hint: draw a diagram)
9. Be able to determine whether a function is odd or even from its **equation**, and/or **graph**
   a) Example. Is the function $f(x)=x^4+x^2$ even or odd? Explain. (Use the definition in the answer is necessary).
   b) Is the function to the right odd or even ?



10. Determine if a binomial is a factor of a particular polynomial. Example: Is (x+3) a factor of $x^3-5x^2+3x-10$?
11. Given a polynomial function in factored form, draw the graph (or be able to recognize it in mulitple choice. Example: $y=-3(x+2)^2(x-3)(2x-5)$.
12. Given the equation of a transformed function be able to state which transformation where done and graph it. Example: $g(x)=-\frac{1}{2}(\frac{1}{3}x-2)+5$ (Hint find a, k, h, q first).
13. Recognize properties of polynomials (domain all real numbers, range is either

bounded above, below, or all real numbers) and be able to define polynomial.

14. Know the difference between the different types of roots and what they look like graphically.
15. Use finite differences to find the type of equation, or the equation itself. Example:

0	0
1	2
2	16
3	54
4	128
5	250
6	432
7	686

Rational Functions

1. Determine the vertical asymptotes of a rational function which you have to factor first. Example: What are the vertical asymptotes of $\frac{1}{3x^2+17x+10}$?
2. Determine the horizontal aymtote of a given rational function. Example 1: $y=\frac{3x^3-5x+6}{5x^3+3x^2}$ Example: $y=\frac{5}{x^2}$
3. Be able to graph a given rational function. Example: $f(x)=\frac{(x^2+9)(x-2)}{x^2(x+3)}$ .Hint: it helps to create a chart of as x--> and f(x)-->.
4. Solve inequalities. Example: $\frac{3x}{(x-6)}<\frac{-5x}{(2x+1)}$, state any restrictions.
5. State the **equation** and give a **graph** that satisfies given conditions. Example:
   - horizontal asymptote at 4
   - vertical asymptote at -3
   - hole at 6
   - passing through the point (0,0).
6. State and recognize properties of rational functions, specific or general (domain, range, intercepts, intervals of increasing/decreasing).
7. Recognize the difference between a hole and an aysmptote.
8. Be able to compare rational graphs with other graphs with asymptotes.

Trigonometry

1. Solve simply and complex trigonometric equations. Example1: Solve $\sin\theta=\frac{\sqrt{3}}{2}$ Example2: $\sin^2\theta+\sin\theta-1=0$
2. Apply the double angle formulas (Given only sum of sines): Example: Find $\sin 2\theta$

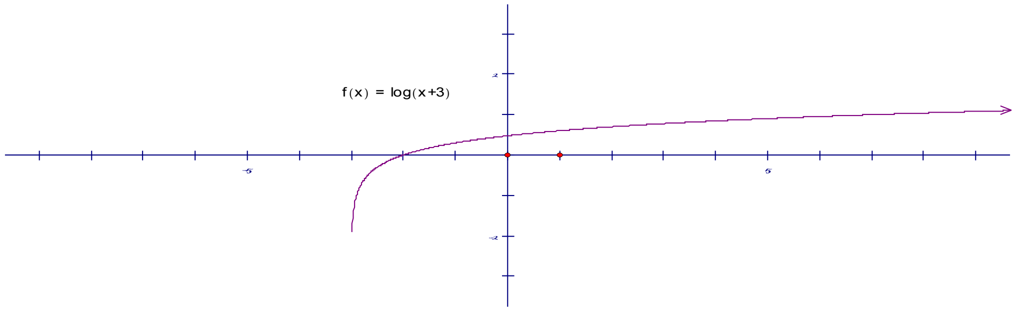
given $\tan\theta=1$.

3. Apply the addition and subtraction formulas: Example: Evaluate exactly: $\cos\frac{\pi}{12}$.
4. Use the cofunctional identities for any given function. Example: $\cos\frac{5\pi}{12}$
5. **Prove** a given trigonometric identity: Example: $\frac{1}{1+sinx}=sec^2 x-\frac{tanx}{\cos x}$
6. Given information about a trigonometric function, state the equation. Example: an amplitute of 3, a phase shift to the right of π and a vertical shift up of 3.
7. Write the equation of a graph with given information of an application (i.e ferris wheel). Example: Ferris wheel has a radius of 10 m and rotates at the rate of one revolution every 100 s. At the bottom of the ride, the passenger is 2 m above the ground. You start your ride from the bottom of the wheel.
   a) Give an equation that models the relationship of passenger height versus time.
   b) Use your equation to find the height at a particular time (example, t=3.5 minutes) Hint: Convert from minutes to seconds.
8. Know the graphs of each of the 6 trigonometric functions.
9. Know how to convert between degrees and radians.
10. Evaluate trigonometric expressions exactly and to a given number of decimal places.
    a) Ex1: Evaluate $\sin\frac{3\pi}{7}$ to four decimal places.
    b) Ex2: Evaluate exactly $\cot\frac{3\pi}{4}$.
11. Graph a transformed function of secondary trigonometric function. Example: $y=3\csc(2\theta+3\pi)+5$
12. Determine the period, phase shift amplitude central axis given an equation (use 11 as an example).
13. Use equivalent expression to find values, and express differently. Example: $\cos x$ is the same as: (use 2 or more ways to express this).

Logarithmic Functions

1. Evaluate simple and complex logarithmic functions exactly. Example1: $\log\frac{1}{100}$.
   Example2: $a^{16\log a^{0.75}}$
2. Apply Logarithm laws and properties to evaluate logs exactly Example1: $\log_6 12+\log_6 3$.
   Example2: Write as a single logarithm 2log5x-[4logx^2+log(x-3)].
3. Evaluate logarithmic expression with bases other than 10. Example: $\log_2 70$.
4. Solve equations with logs. Example: $3-\log_4(x^2+2)=0$
5. Know all the laws (product, quotient, power) for both exponents and logarithms.
6. Given two logarithmic equations, find an algebraic expression for another logarithm. **Example**: Given $\log_{16}2=x$ and $\log_{64}4=y$, find an algebraic expression for $\log_4 8$.

7. Given the graph of a function, give it's equation. Example:



8. Graph a logarithmic function given its equation. Example: 2log(x+5)-6.
9. Be able to solve exponential problems using logs. Example: The amount of bacterial grows according function. $p(t)=22(3^{\frac{t}{5}})$, where p is the population is 1000s and t ithe time in minutes it has been exposed. If the population is 24 x 10^4, how long as it been exposed.
10. Understand the restrictions of log.
11. Apply transformations on logarithmic equations. Example: graph log(2x)
12. Describe the relationship between logarithms and exponential functions.

Combining Functions

1. Given two functions, find the composite. Example: f(x)=3x and $g(x)=2x^3+3$, find f(g(x)).
2. Given two different functions, be able to find the domain and range of the sum/composite of the two functions. Example if $f(x)=\sqrt{x+1}$ and $g(x)=\log(-x+1)$ find the domain of $(f\,o\,g)(x)$.
3. Know the similarities and differences between different types of combined functions (sum, difference, product, quotient and composite).
4. Find the instantaneous rate of change of a combined function. Example, if $f(x)=\sin x$ and $g(x)=x^2$, find the instantaneous rate of change when $x=2$.
5. Given several functions, be able to state the equations of complex composites. Example, given $f(x)=3x+5$, $g(x)=-\sin x$ and $h(x)=\frac{1}{x}$, what is the equation of $(f\,o\,g)(x)-(g\,o\,h)(x)$.
6. Be able to find the composite of two functions for a word problem. Example: Given that the radius of fire widens 3m each day. Build a function that describes the radius of the fire after 12 days.
   Given two graphs, find the values the composite of the two function of a particular value. Example: Find $f(g(\pi))$.