The final exam is on Thursday, July 26th in Thimann Lab 101 (our usual room) from 1:00pm-4:30pm (our usual time). Bring a photo ID with you to the exam. No notes or graphing calculators allowed during the exam. Scientific calculators will be allowed.

The final will be composed of nine questions: six questions coming from chapters 5, 6 & 7 and three questions coming from chapters 3 & 4. (The questions may have multiple parts.)

**Topics and Breakdown of The Final**

**Material From Chapters 3 & 4:**

- **(15 points) Rational functions:** find domain, write in lowest terms, find the vertical asymptote(s), determine behavior on either side of the vertical asymptote(s), find the intercepts, determine behavior at the x-intercept(s) and find (if there is one) the horizontal/oblique asymptote. (YOU WILL NOT BE ASKED TO GRAPH THE FUNCTION.)
- **(15 points) Composite functions:** evaluate, determine domain and find general formula for composite functions.
- **(20 points) Logarithms and exponentials:** solving/simplifying exponential and logarithmic equations/expressions. (Formulas will be given for properties of logarithms.)

**Material From Chapters 5, 6 & 7:**

- **(30 points) Finding exact values of trig. functions:** use periodicity, the sign (quadrants where trig functions are +/-), inverse trig. functions, even-odd properties and the various angle formulas of trigonometric functions to find exact values. (YOU WILL NEED TO KNOW THE UNIT CIRCLE.)
- **(10 points) Applications to linear and angular speed.**
- **(15 points) Graphing trig. functions:** use transformations to graph one period of a trig. function of the form: \( y = A\cos(\omega x) \), \( y = A\sin(\omega x) \) or \( y = A\tan(\omega x) \).
- **(20 points) Solving trig. equations:** find solutions when restricted to an interval and find all solutions.
- **(10 points) Establishing trig. identities:** use fundamental identities (quotient identities) and Pythagorean identities.
- **(15 points) Applications to right triangles.**
Information & Formulas to be Supplied on The Final

The following information and formulas will be typed on the front page of your exam:

\[ f^{-1}(f(x)) = x \text{ for all } x \text{ in the domain of } f \]
\[ f(f^{-1}(x)) = x \text{ for all } x \text{ in the domain of } f^{-1} \]

\[ a^{\log_a(M)} = M \quad \log_a(a^r) = r \quad \log_a(M) = \frac{\log_b(M)}{\log_b(a)} \]
\[ \log_a(M^r) = r \cdot \log_a(M) \quad \log_a \left(\frac{M}{N}\right) = \log_a(M) - \log_a(N) \]
\[ a^r = e^{r \cdot \ln(a)} \quad \log_a(M \cdot N) = \log_a(M) + \log_a(N) \]

\[ \sin(2\theta) = 2\sin(\theta)\cos(\theta) \quad \tan(2\theta) = \frac{2\tan(\theta)}{1 - \tan^2(\theta)} \]
\[ \cos(2\theta) = \cos^2(\theta) - \sin^2(\theta) = 1 - 2\sin^2(\theta) \]

\[ \sin \left(\frac{\theta}{2}\right) = \pm \sqrt{\frac{1 - \cos(\theta)}{2}} \quad \cos \left(\frac{\theta}{2}\right) = \pm \sqrt{\frac{1 + \cos(\theta)}{2}} \]
\[ \tan \left(\frac{\theta}{2}\right) = \frac{\sin(\theta)}{1 + \cos(\theta)} = \frac{1 - \cos(\theta)}{\sin(\theta)} \]

\[ \sin \left(\frac{\pi}{2} - \theta\right) = \cos(\theta) \quad \cos \left(\frac{\pi}{2} - \theta\right) = \sin(\theta) \]
\[ \sin(\pi - \theta) = \sin(\theta) \quad \cos(\pi - \theta) = -\cos(\theta) \]