MAT122
Extra Credit. Due April 7.

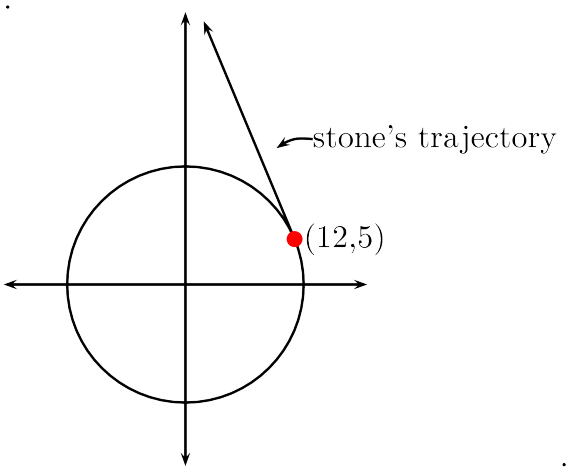
Solutions must be neat and stapled. Present each answer on a separate sheet.

1. Which is bigger, e^π or π^e? Show this without using a calculator.

2. Find $\dfrac{d}{dx}x^{x^x}$. Hint: It may help to practice with the function x^x first. Remember that $a = e^{\ln a}$.

3. When you watch an object recede into the distance, its size appears to decrease. This is why artists draw distant objects so that their size is small relative to the size of closer objects. Suppose you leap off the rear end of a freight train which travels at a constant velocity 10m/s. You turn to watch the train travel away. If the rear of the train has the shape of a rectangle with height 3m and width 2m, at what rate does the area of this rectangle appear to decrease as a function of time? Let $t = 0$ denote the instant in time when you leap from the train.

4. You hold a 13 inch long sling which you spin at 10 revolutions per second. Imagine a Euclidean coordinate system centered at your hand so that the end of the sling traces out a circle as you spin it. You use the sling to propel a stone horizontally when the stone is at position (12,5) in the coordinate system.



Suppose you hold the sling 60 inches high. Physics tells us that the height of the stone after release will be given by the expression $at^2 + h_0$ where $a = -32\text{ft/s}$ denotes acceleration due to gravity, h_0 denotes the initial height in feet, and t denotes the time after release. Where in the coordinate system does the stone land?