MATH 120A
Exam 2
Version 1
May 22, 2003

Name _____

Section _____

1	12	
2	10	
3	14	
4	14	
Total	50	

- You are allowed to use a calculator and one sheet of hand-written notes.
- Check that your exam contains four questions.
- Show all your work and clearly indicate your final answer.
- When rounding is necessary, unless otherwise instructed, you may round your **final answer** to two digits after the decimal.
- If you use a trial-and-error or guess-and-check method to solve a problem when an algebraic method is available, you will not receive full credit.
- Give answers with appropriate units.
- Raise your hand if you have a question.
- You have 50 minutes to complete the exam.
- Please put your name on your sheet of notes and turn it in with the exam.

GOOD LUCK!

1. (12 points) Let $f(x) = \dfrac{x-1}{4x+7}$.

   (a) (8 points) Find each of the following, if it exists:
   the zero(s) of $f(x)$:

   the y-intercept of $f(x)$:

   the vertical asymptote(s) of $f(x)$:

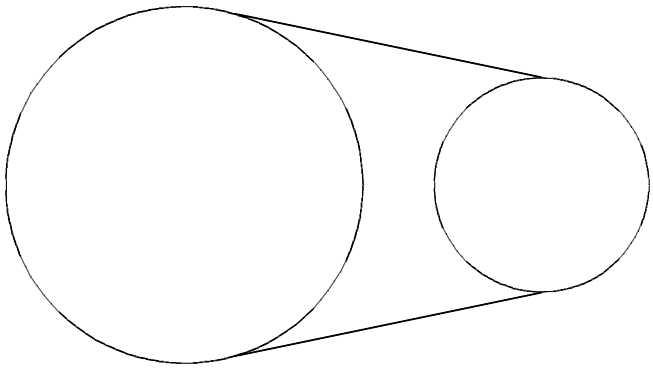
   the horizontal asymptote of $f(x)$:

   (b) (4 points) Find the inverse of $f(x)$.

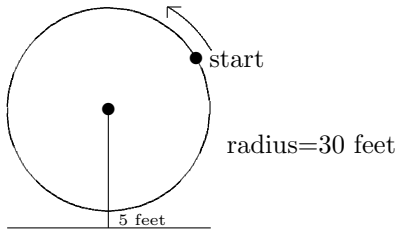
2. (10 points)

   (a) (4 points) If $\sin\theta = \frac{4}{17}$, find the two possible values of $\cos\theta$. (Either give an exact answer or round your final answer to **four** digits after the decimal.)

   (b) (6 points) The wheels below are connected by a belt. The larger wheel has radius 16 inches and rotates at a rate of 50 RPM. The smaller wheel rotates at a rate of 112 RPM. Compute the radius of the smaller wheel.



3. (14 points) Your seat on a ferris wheel is at the indicated position at time $t = 0$.



The wheel has a radius of 30 feet and is rotating counter-clockwise at a rate of 10 RPM. The bottom of the wheel is 5 feet off the ground. You find it takes 4 seconds to reach the bottom of the ride for the first time.

(a) (4 points) Compute your angular speed in radians per second.

(b) (6 points) Impose a coordinate system by clearly marking your choice for the origin in the picture above. Give the x- and y- coordinates of your position t seconds after the start of the ride.

(c) (4 points) When are the first and second times you are at the top of the ride?

4. (14 points) Scientists are studying the population of naked mole rats on the island of Socotra. The population is a sinusoidal function of time t in years. The population reaches a minimum of 24 mole rats 4 years after the start of the study. The next minimum occurs 12 years after the start of the study. The maximum population is 66 mole rats.

   (a) (6 points) Give a sinusoidal function for $P(t)$, the mole rat population t years after the study begins.

   (b) (2 points) What is the population when the study begins?

   (c) (6 points) During the first 15 years of the study, what total length of time (in years) is the population at least 50 mole rats?