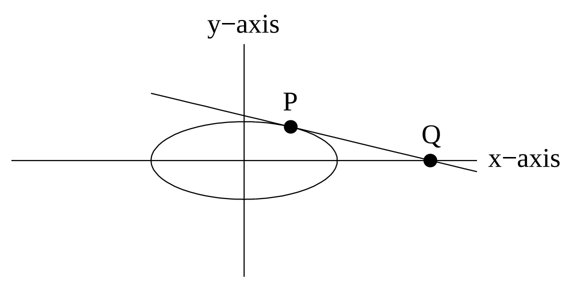
HOMEWORK (WINTER/SPRING), WEEK 4

1. Stewart, section 3.3: #1-23(odd), 35, 37.

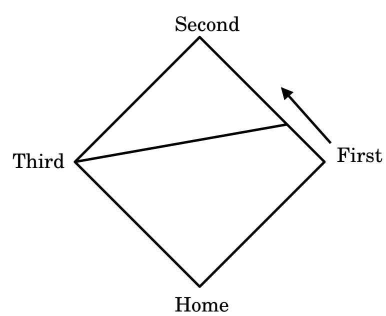
2. An object is moving back and forth on the x-axis according to the equation $x = 3\sin(20\pi t)$, $t \geq 0$, where x is measured in cm and t in seconds. In this problem leave all answers in exact form and include the correct units.
   (a) How many complete back-and-forth motions (from the origin to the right, then to the left, and then back to the origin) does the object make in one second?
   (b) What is t the first time that the object is at its farthest right?
   (c) At the time found in part (b), what is the object's velocity?
   (d) At the time found in part (b), what is the object's acceleration?

3. Stewart, section 3.4: #1-6. (more in this section next week).

4. If we plot the points (x, y) satisfying the equation $\frac{x^2}{4} + y^2 = 1$, the result is an ellipse. This ellipse is pictured, along with a line that is tangent to the ellipse at P and passes through the point $Q = (4, 0)$. Use calculus to find the equation of the line. You will need the chain rule.



5. A baseball diamond is a square 90 ft on a side. A player runs from first bast to second base at 16 ft/sec. At what rate is the player's distance from third base decreasing when the player is 20 ft from first base?



6. The length of some fish are modeled by a *von Bertalanffy* growth function. For Pacific halibut, this function has the form

$$L(t) = 200(1 - 0.956e^{-0.18t})$$

where $L(t)$ is the length (in centimeters) of a fish t years old.

(a) Find the rate of change of the length as a function of time.
(b) At what rate is the fish growing at age $t = 0, 1, 6$ years?
(c) When will the fish be growing at a rate of 6 cm/yr?

7. Let P be a point on the graph of $y = x^3$. The tangent line at P will intersect the graph at the point Q. Show that the slope of the curve at Q is four times the slope at P.