2.7/2.10 Handout

1. Let $f(x) = \sin^2(x)$. Find $f'(x)$.

2. Let $g(t) = \sin(\ln(t))$. Find $g'(t)$.

3. (A slightly unrealistic model of energy) Suppose the amount of energy E a plant has, measured in units of Joules, follows a sinusoidal model

$$E(t) = 12 - 3\cos\left(\frac{2\pi}{T}t\right)$$

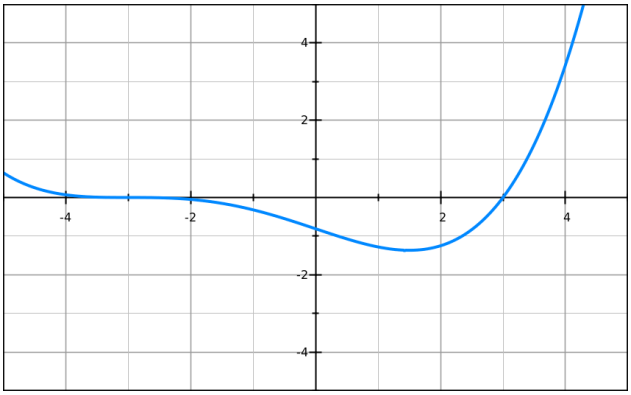
where t is measured in hours since midnight (so $t = 12$ is noon).

   (a) What is the average energy contained in the plant?

   (b) What value of T makes the most sense for our model?

   (c) How quickly is the energy increasing right when the sun comes up?

4. Suppose the graph of f' for a function f is graphed below.



(a) What are the critical points of f?

(b) Find the inflection points of f.

(c) On which intervals is f concave up? How about concave down?

5. Let $f(x) = \dfrac{x}{x^2+1}$. Determine (a) the critical points of f, (b) the inflection points of f, and (c) the intervals where f is concave up and down. You may use a graph to double check your work, but you must find the intervals by hand. (Recommendation: use a new sheet of paper.)