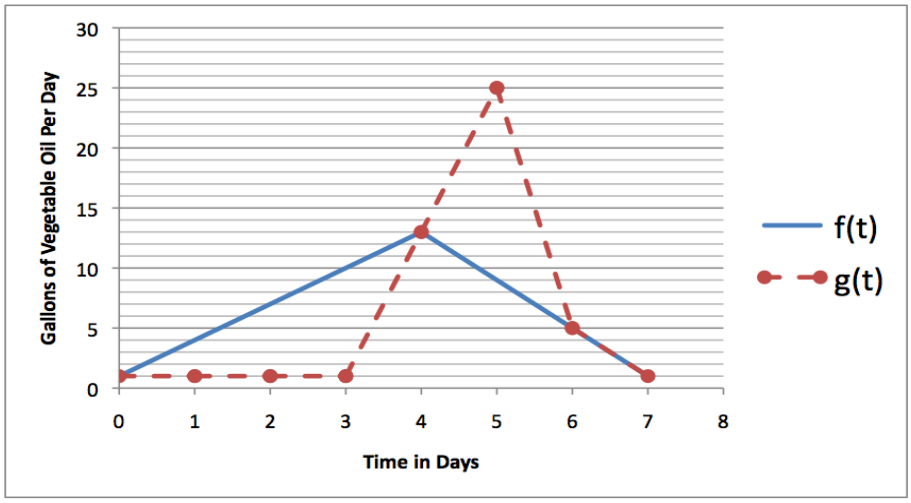
5. [13 points] In 2008, the burrito chain BTB began to operate a "Party Bus" powered by waste vegetable oil. If t is the number of days since 12:01 a.m. on October 11, 2010, then $f(t)$ is the amount in gallons per day of waste vegetable oil produced by BTB restaurant chain at time t and $g(t)$ is the amount consumed by the party bus in gallons per day at time t. Let $R(t)$ be the size of BTB's vegetable oil reserves in gallons at time t. If BTB has 20 gallons held in reserve at time $t = 0$, use the graphs below to answer the following questions. All the questions below consider only $0 \leq t \leq 7$.



a. [1 point] Estimate $R(3)$

Solution: $R(3) = 20 + \int_0^3 f(t) - g(t)dt = 33.5$ gallons

b. [2 points] When does BTB have a maximum volume of vegetable oil in reserve?

Solution: After 4 days (Oct 15).

c. [3 points] Suppose you need a ride to the airport on October 16. Will BTB have any vegetable oil in reserve to power their bus and drive you to the airport that day?

Solution: $R(5) = 20 + \int_0^5 R(t)dt = 29$ gallons

d. [3 points] Find all critical points of $R(t)$.

Solution: Critical points: $t = 4$ and all $6 \leq t < 7$.

e. [4 points] On what intervals is $R(t)$ concave up? On what intervals is $R(t)$ concave down?