

**FTC****19**

Name: \_\_\_\_\_

**Calculators permitted. Show All Work!!**

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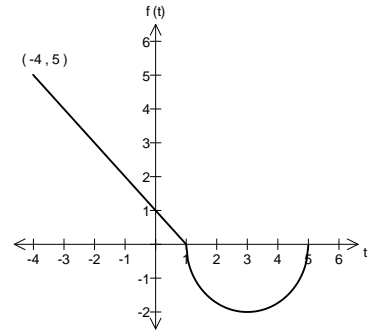
1. The rate of water pouring into a tank is modeled by the function  $E(t) = 8$  gallons per hour and rate of water pouring out of the tank is modeled by the function  $L(t) = 10e^{-t}$  gallons per hour. If the tank contains 30 gallons of water at time  $t = 0$ , determine each of the following.
- a. Amount of water lost from the tank in the first 2.5 hours. [3 marks]
- b. Amount of water remaining in the tank after 4 hours. [3 marks]
- c. Setup, but do not evaluate, an integral equation that determines how long it takes for the tank to empty. [3 marks]

2. The graph of  $f(t)$  consists of a line segment and a semi-circle, as shown here:

If  $g(x) = \int_1^x f(t) dt$  on  $x \in [-4, 5]$ , determine each of the following.

a.  $g(1)$ ,  $g(3)$ ,  $g'(1)$ ,  $g'(3)$

[4 marks]



b.  $x$ -coordinate(s) of all local maxima of  $g(x)$ . Justify your answer.

[2 marks]

c. Interval(s) on which  $g(x)$  is concave up. Justify your answer.

[2 marks]

d.  $x$ -coordinate(s) of all Points of Inflection of  $g(x)$ . Justify your answer.

[2 marks]