

## Group Homework #2

### Daylight

It is possible to define a function of the form  $L(t) = A + B \cos(Ct + D)$  which gives the number of hours of daylight  $t$  days after January 1st.

- How long is the period of this function? Use this to determine the value of  $C$ .
- What is the longest day of the year? Use this to determine the value of  $D$ .
- How many hours of daylight are there on the autumnal equinox? Use this to determine the value of  $A$ .
- How many hours of daylight were there today? Use this to determine the value of  $B$ .
- Use your equation to predict how many hours of daylight there will be on Halloween.

### Constant Derivatives

- Suppose that  $f'(x) = 1$  for all  $x$ . Find an algebraic expression for  $f(x)$  if  $f(0) = 2$ .
- Suppose that  $f'(x) = 1$  for all  $x$ . Find an algebraic expression for  $f(x)$  if  $f(2) = 1$ .
- Suppose that  $f'(x) = 5$  for all  $x$ . Find an algebraic expression for  $f(x)$  if  $f(1) = -3$ .
- Suppose that  $f'(x) = -2$  for all  $x$ . Find an algebraic expression for  $f(x)$  if  $f(4) = -5$ .
- Suppose that  $f'(x) = m$  for all  $x$ . Find an algebraic expression for  $f(x)$  if  $f(a) = b$ .

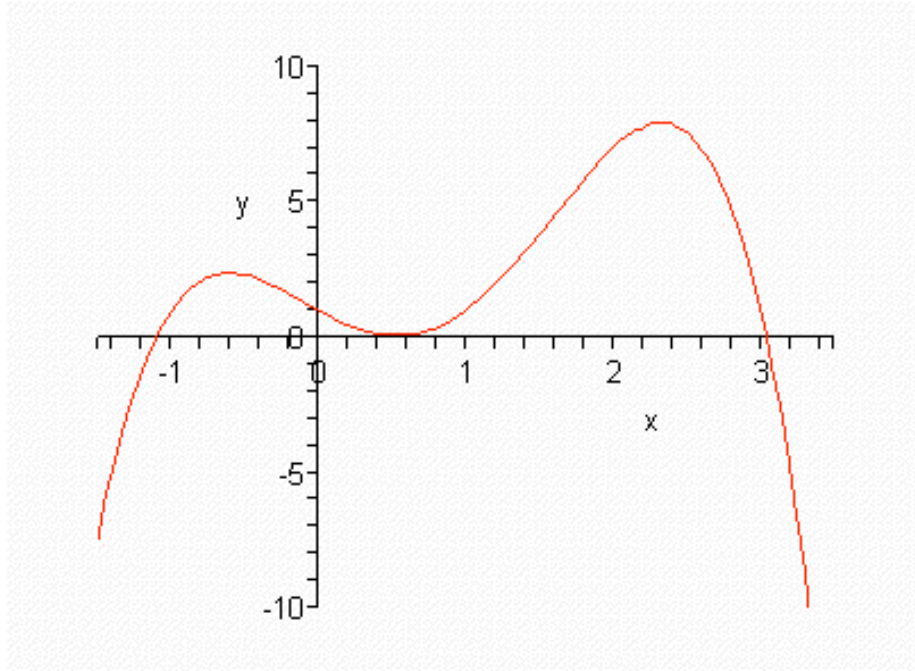
### Hot Coffee

Suppose that a cup of hot coffee is poured into a mug in a room with ambient temperature of 25 degrees Celsius. Let  $T(t)$  be the temperature (in degrees Celsius) of the coffee in the cup  $t$  minutes after the coffee was poured.

- Describe the graph of  $T(t)$ .
- What are the units of  $T'(t)$ ?
- Is  $T(5) > 0$ ? Justify your answer.
- Is  $T'(5) > 0$ ? Justify your answer.
- What is the approximate value of  $T(300)$ ? Explain why.
- What is the approximate value of  $T'(300)$ ? Explain why.

### One Graph

If the following is a graph of  $f'(x)$ , answer the questions below



- Where is  $f(x)$  increasing? Where is it decreasing?
- Where is  $f(x)$  concave up? Where is it concave down?
- Does  $f(x)$  have any local maxima or minima? If so, identify them all.
- Does  $f(x)$  have any inflection points? If so, identify them all.
- Rank the following values in increasing order:  $f(-1)$ ,  $f(0)$ ,  $f(1)$  and  $f(3)$ .