

**10.** [8 points]

- a. [4 points] The periodic function  $y = f(t)$  gives the height, in meters above sea level, of the tide  $t$  hours after noon in Florence. The maximum height of the tide is called a high tide, whilst the minimum height of a tide is called a low tide. In Florence a high tide of 0.2 meters above sea level occurred at 2 pm, while a low tide of  $-0.8$  meters (0.8 meters below sea level) will occur at 8 pm. Find the amplitude and the midline of  $f(t)$ .

*Solution:*

$$\text{Amplitude of } f(t) = \frac{0.2 - (-0.8)}{2} = 0.5 \qquad \text{Midline of } f(t): y = \frac{0.2 + (-0.8)}{2} = -0.3$$

- b. [4 points] The function  $g(x)$  gives the height, in meters above sea level, of the tide  $x$  hours after noon in Edinburgh. Edinburgh is on the GMT time zone, so it is one hour behind Florence. The graph of  $y = g(x)$  has:
- Amplitude equal to 2.5 meters.
  - Midline  $y = 1.25$ .

If the high tides and low tides times match across the globe (for example if a high tide occurs in Florence at 2 pm, then a high tide occurs in Edinburgh at 1 pm) and the graph of  $g(x)$  can be obtained by applying transformations to the graph of  $f$ , write a formula for  $g(x)$  in terms of the function  $f$ .

*Solution:*  $g(x) = 5f(x + 1) + 2.75$ .