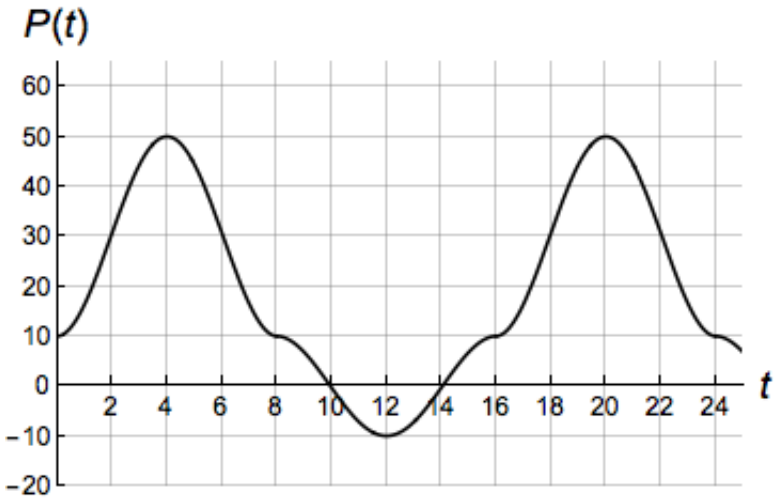
2. [11 points] Let $P(t)$ be the average temperature (in ^{0}F) in a small moon that rotates around a planet at time t (in hours). Suppose that $P(t)$ is a periodic function with period less than 20 hours. The graph of $y = P(t)$ is shown below



a. [2 points] Find the period of $P(t)$:

Solution: Period of $P(t)$ =16.

b. [2 points] Find the amplitude of the function $P(t)$:

Solution: Amplitude=$\frac{50-(-10)}{2} = 30^o$ F

c. [2 points] Find the equation of the midline of the function $P(t)$:

Solution: Midline: $y = \frac{50+(-10)}{2} = 20$.

d. [3 points] What is the smallest value of t that satisfies $t > 24$ and $P(t) = 30$?

Solution: The solutions to $P(t) = 30$ for $0 < t < 24$ are (from the graph) $t = 2, 6, 18$ and 22. Hence the next solution is at $t = 18 + 16 = 34$ hours.

e. [2 points] Let $k(t) = 2P(3t)$. What is the period of the function $k(t)$?

Solution: The graph of $k(t)$ can be obtained from the graph of $P(t)$ by applying a vertical stretch by 2 and a horizontal compression by $\frac{1}{3}$. The only transformation that determines the period of $k(t)$ is the horizontal compression, then the period of $k(t)$ is $\frac{16}{3}$ hours.