

## Accumulation

Directions: Solve the problems. Use a calculator.

1. Midday traffic through an intersection can be modeled by the function  $74 + 6 \cos\left(\frac{t}{3}\right)$  cars per minute, where  $t$  is measured in minutes after noon. Find the number of cars that pass through this intersection between noon and 12:30 PM.
2. At 6:00 AM, a tank holds 2500 gallons of water. Over the next 18 hours, it is being filled at a constant rate of 100 gallons per hour while water is taken out at a rate given by  $W(t) = 120 + 60 \sin(4\sqrt{t})$  gallons per hour, where  $t$  is measured in hours after 6:00 AM. How much water is in the tank at midnight, when  $t = 18$ ?
3. Ballots are cast for an election at a rate of  $r(t) = 5 \sin(0.02t - 3) + 50 + 0.2t$  ballots per hour from the opening of the polls at 8:00am ( $t = 0$ ) until 6:00pm. How many ballots were cast?
4. Oil is pumped into a tank for 24 hours starting at midnight on Tuesday at a rate of  $p(t) = 2 \ln(t + 1)$  gallons per hour. Starting at 10:00am on Tuesday, oil is also removed from the tank at a rate of  $r(t) = 2 + 2^{-t}$  gallons per hour and continues to be removed until midnight on Wednesday. How much oil is in the tank at midnight on Wednesday?
5. The rate at which violent crimes were committed in a large city during the year 2022 is given by the function  $V(t) = \frac{t}{2} \sin\left(\frac{t}{3}\right) + \frac{t}{5} + 3$  where  $V$  is measured in hundreds of violent crimes and  $t$  is measured in months with  $t = 0$  being the beginning of January 2022. How many violent crimes were committed during the entire year of 2022?