6.1, #9. The graph is that given by figure 6.5 on page 309 with one change: the graph $y = 50$ for the truck starts at the y-axis. The two graphs intersect twice, at $t = 0.7$ and $t = 4.3$. At the beginning the truck is ahead of the car. The first intersection gives the time when the lead of the truck is maximal. The car then overtakes the truck sometime between 1 pm and 2 pm. The second intersection gives the time when the lead of the car is maximal.

6.2, #1. $\displaystyle\int_1^3 (x^2 - x)\,dx = \frac{1}{3}\int_1^3 3x^2\,dx - \frac{1}{2}\int_1^3 2x\,dx = \frac{26}{3} - \frac{8}{2} = \frac{14}{3}.$

6.2, #2. $\int_a^b 1\,dx$ is the area of the rectangle with top on the line $y = 1$, bottom on the x-axis, and sides on the lines $x = a$ and $x = b$. So $\int_a^b 1\,dx = b - a$. In particular,

$$\int_2^5 a\,dx = 3, \quad \int_{-3}^8 1\,dx = 11, \quad \int_1^3 23\,dx = 23\int_1^3 1\,dx = 46.$$

6.2, #3. $\int_a^b x\,dx$ for $0 \le a \le b$ is the area of the trapezoid with top on the line $y = x$, bottom on the x-axis, and sides on the lines $x = a$ and $x = b$. So

$$\int_a^b x\,dx = \frac{1}{2}(b+a)(b-a) = \frac{1}{2}(b^2 - a^2).$$

The formula holds when $a \le 0 \le b$. For example, $\int_{-3}^8 x\,dx = \int_3^8 x\,dx$ since $\int_{-3}^3 x\,dx = 0$ by the symmetry of graph of $y = x$ with respect to the origin.

The formula also holds when $a \le b \le 0$. For $\int_a^b x\,dx = -\int_{-b}^{-a} x\,dx$ by the geometric interpretation of the integrals. In particular,

$$\int_2^5 x\,dx = 21/2, \quad \int_{-3}^8 x\,dx = 55/2, \quad \int_1^3 5x\,dx = 5 \cdot 4 = 20.$$

6.2 #8. The definite integral $\int_0^1 e^{x^2}dx$ can be interpreted as the area between the graphs of $y = 0$ and $y = e^{x^2}$ between the vertical lines $x = 0$ and $x = 1$. This area is positive since $0 < e^{x^2}$ for $0 < x \le 1$. Since $e < 3$ and the function $f(x) = e^{x^2}$ is increasing on [0, 1] it follows that $e^{x^2} < 3$ for $0 \le x \le 1$. Comparing areas we see that

$$\int_0^1 e^{x^2}dx < \int_0^1 3dx = 3(1) - 3(0) = 3.$$