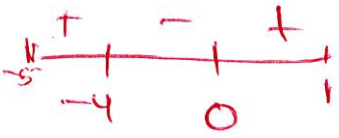
Warm Up

Evaluate each definite integral.



1. $\int_{-5}^{1} -\left|x^2 + 4x\right| dx$

$-7/3 \quad -32/3 \quad -7/3$

$\int_{-5}^{-4} -1\left(x^2+4x\right) + \int_{-4}^{0} -1\left(-x^2-4x\right) + \int_{0}^{1} -1\left(x^2+4x\right)$

$-\frac{1}{3}x^3 - 2x^2 \Big|_{-5}^{-4}$ $\quad -\frac{32}{3} - -\frac{25}{3}$ $\quad -\frac{25}{3} + \frac{32}{3}$ $\quad \frac{125}{3} - 50$ $\quad 64/3 - 32$

$= -46/3$

2. Ex: $f(x) = \begin{cases} \frac{x}{2} - 1, & x \le 2 \\ x^2 - 6x + 8, & x > 2 \end{cases}$ Find: $\int_0^3 f(x)\,dx$

$-2/3 \quad = \quad -5/3$

$\int_0^2 \frac{x}{2} - 1 + \int_2^3 x^2 - 6x + 8$

$\frac{1}{4}x^2 - x \Big|_0^2 \qquad \frac{1}{3}x^3 - 3x^2 + 8x \Big|_2^3$

3. A car travelling at 75 miles per hour is brought to a stop, at a constant deceleration, 150 feet from where the brakes are applied.

75 mph = 110 ft/sec.

a. How far has the car moved when its speed has been reduced to 40 mph?

40 mph = 58 2/3 ft/sec.

$a(t) = -k$

$v(t) = -kt + 110$

$s(t) = -\frac{1}{2}kt^2 + 110t \qquad s_0 = 0$

$v(t) = 0$ after car moves 150 ft.

$0 = -kt + 110 \qquad t = 110/k$

$a(t) = -40\frac{1}{3}$

$v(t) = -40\frac{1}{3}t + 110$

$58\frac{2}{3} = -40\frac{1}{3}t + 110$

$150 = -\frac{1}{2}\left(\frac{110}{k}\right)^2 \cdot k + 110\left(\frac{110}{k}\right)$

$k = 40\frac{1}{3}$

$s(t) = -\frac{121}{6}t^2 + 110t$

$t = 14/11 \qquad s(14/11) = 107.\overline{3}$ feet