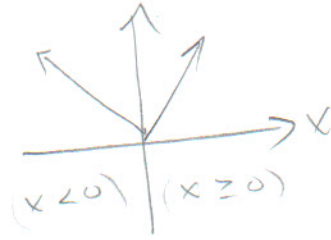


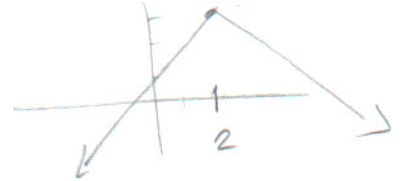
## Integration with Absolute Value

$$|x| = \begin{cases} -x & \text{for } x < 0 \\ x & \text{for } x \geq 0 \end{cases}$$



Example  $\int_0^5 3 - |x-2| dx =$

$$\begin{aligned} x-2 &= 0 \\ x &= 2 \end{aligned}$$



$$\int_0^2 3 - (-(x-2)) dx + \int_2^5 3 - (x-2) dx =$$

$$|x-2| = \begin{cases} -(x-2) & \text{for } x < 2 \\ (x-2) & \text{for } x \geq 2 \end{cases}$$

$$\int_0^2 3 + x - 2 dx + \int_2^5 3 - x + 2 dx =$$

$$\int_0^2 x + 1 dx + \int_2^5 5 - x dx =$$

$$\left. \frac{x^2}{2} + x \right|_0^2 + \left. 5x - \frac{x^2}{2} \right|_2^5 =$$

$$\frac{4}{2} + 2 - 0 + 25 - \frac{25}{2} - (10 - 2) =$$

$$(2+2) + 25 - \frac{25}{2} - (8) =$$

$$\left(\frac{2}{2}\right) 21 - \frac{25}{2} = \frac{42}{2} - \frac{25}{2} = \frac{17}{2}$$
$$= \boxed{8.5}$$