Integrate Absolute Value

p. 366 - 373 (5.3) # 66

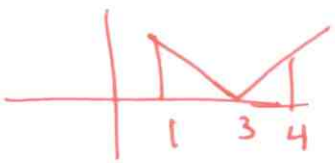
1. Find zeros by setting the inside of the absolute bars = 0.
2. Graph $f(x)$ using the limits as the boundaries.
3. Find the area from the lower limit to the upper limit.

Application of Integrating Absolute Value:

The **Total Distance** traveled of an object over [a, b] is $\int_a^b |v(t)|\,dt$.

Evaluate:

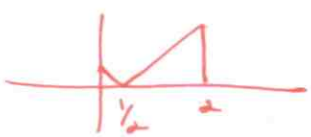
**1. $\int_1^4 |x - 3|\,dx$



$A = \frac{1}{2}(2)(2) + \frac{1}{2}(1)(1) = \boxed{\frac{5}{2}}$

2. $\int_0^2 |2x - 1|\,dx$

$2x - 1 = 0$
$x = \frac{1}{2}$



$f(0) = |2(0) - 1| = 1$
$f(2) = |2(2) - 1| = 3$

$A = \frac{1}{2}\left(\frac{1}{2}\right)(1) + \frac{1}{2}\left(\frac{3}{2}\right)(3) = \frac{1}{4} + \frac{9}{4} = \boxed{\frac{5}{2}}$

**calc.(FR) 3. An object moves along the x-axis with a velocity of $v(t) = \sin\left(\frac{\pi}{3}t\right)$ for time $t \geq 0$. What is the total distance traveled by the object over the time interval $0 \leq t \leq 4$?

$\int_0^4 \left|\sin\left(\frac{\pi}{3}t\right)\right| dt \approx \boxed{2.387 \text{ units}}$