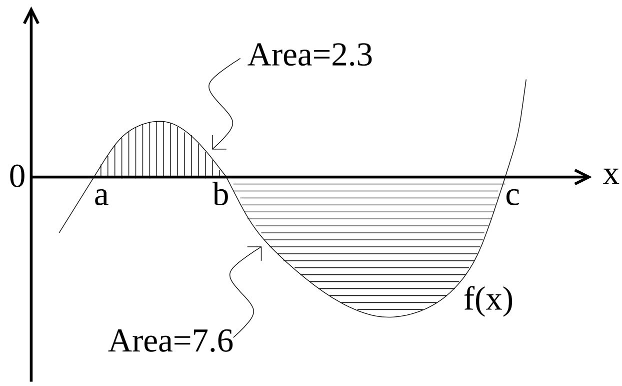
**6.** (8 points) Use the figure below to calculate the numerical values of the definite integrals in parts (a) through (d). You need not show your reasoning.



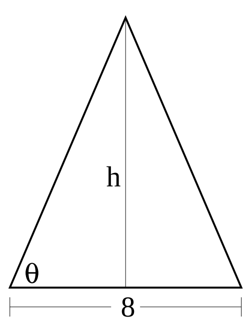

**(a)** $\int_a^b f(x)\,dx =$ 2.3

**(b)** $\int_b^c f(x)\,dx =$ $-7.6$

**(c)** $\int_a^c f(x)\,dx =$ $-5.3$

**(d)** $\int_b^a f(x)\,dx =$ $-2.3$

**7.** (8 points) An isosceles triangle has a base of length 8 meters. If $\theta$ denotes the angle opposite one of the two equal sides, and if $\theta$ is increasing at a constant rate of of 0.1 radians per second, how fast is the area of the triangle increasing when $\theta = \pi/6$?




**Solution:** *If $A(\theta)$ is the area of the triangle with angle $\theta$, then we are asked to find the rate of change of $A$ with respect to time when $\theta = \pi/6$. We are given that $d\theta/dt = .1$ radians per second.*

*Let $h$ denote the height of the triangle. Since the triangle is isosceles, the perpendicular bisector of the base passes through the top vertex so $\tan\theta = h/(\text{half of base}) = h/4$ or $h = 4\tan\theta$. Thus, the area $A$ of the triangle is*

$$A = \frac{1}{2} base \cdot height = \frac{1}{2}(8)\cdot(4\tan\theta) = 16\tan\theta \quad \textit{square meters.}$$

*From the chain rule and the formula for the derivative of the tangent function, we find $dA/dt = \left(16/\cos^2\theta\right) d\theta/dt$. When $\theta = \pi/6$, $\cos\theta = \sqrt{3}/2$ so at this time,*

$$\frac{dA}{dt} = \frac{16}{(\sqrt{3}/2)^2}\frac{d\theta}{dt} = \frac{64}{3}(.1) = \frac{6.4}{3} \simeq 2.1333 \quad \textit{square meters per second.}$$