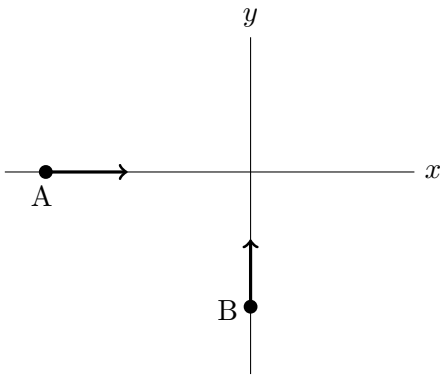
5. [11 points]
Two cars, A and B, are driving along straight roads towards a common intersection, as pictured to the right. Car A is driving due east, and Car B due north. At 12pm, Car A is west of the intersection and Car B south of it, so that they will both reach the intersection sometime later that afternoon.



Let $u(t)$ be the instantaneous velocity of Car A t hours after 12pm, and $v(t)$ the instantaneous velocity of Car B t hours after 12pm, both in kilometers per hour (kph). Assume $u(t)$ is positive when Car A is traveling east, and $v(t)$ is positive when Car B is traveling north.

a. [2 points] Assume Car A reaches the intersection a hours after 12pm, and Car B reaches the intersection b hours after 12pm. Circle the **one best** practical interpretation of the equation

$$\int_0^a u(t)\,dt = \int_0^b v(t)\,dt.$$

i. The two cars arrive at the intersection at the same time.

ii. The two cars pass through the intersection traveling the same speed.

iii. The two cars start the same distance away from the intersection at 12pm.

iv. The difference between the two cars' initial speeds at 12pm equals the difference between their speeds at the moments when they pass through the intersection.

v. NONE OF THESE.

b. [3 points] Circle the **one** equation below that **best** represents the following statement: "Car A is traveling about 5 kph slower at 2:03pm than it was traveling at 2pm."

(i) $(u^{-1})'(5) = \dfrac{3}{60}$ (iii) $u'(2.05) = -100$ (v) $\int_2^{2.03} u(t)\,dt = -5/3$

(ii) $(u^{-1})'(5) = 2$ (iv) $u'(2) = -5/3$ (vi) $\int_2^{2.03} u'(t)\,dt = -5/3$

c. [3 points] Write a sentence that gives a practical interpretation of the equation

$$\int_0^3 u(t)\,dt = 296.$$

d. [3 points] Write a mathematical equation that represents the following statement: "The average velocity of Car B over the three hours between 12pm and 3pm is 99 kph."

Answer: _____