

Directions: Beginning in the first cell marked #1, find the requested information. To advance in the circuit, hunt for your answer and mark that cell #2. Work #2 and find your answer to move to cell #3. Continue working in this manner until you complete the circuit. Then verify your results by picking one of the remaining cells, call it A and keep lettering until it loops back to A. The smaller circuit (there will be 2, 3, 4, or 5 cells) and the main circuit will together use every cell. **This is a calculator active activity.**

<p><u>1</u> Ans: 13,738</p> <p>A cylindrical tank is having water pumped in at a rate of 45 liters/minute and is releasing water at the bottom at a rate of 25 liters/minute. After five minutes, what is the net change in the volume of the water in the tank in liters?</p>	<p>____ Ans: 5.188</p> <p>A stormwater tank contains 13,000 gallons at the start of a storm ($t = 0$). Over the next $0 \leq t \leq 24$ hours, rain adds water to the tank at a rate modeled by $r(t) = 110 + 15 \sin(0.5\sqrt{t})$ in gallons per hour and usage by buildings attached to the tank is modeled by $u(t) = 95 - 10 \cos\left(\frac{t}{24}\right)$ in gallons per hour. How much water (to the nearest gallon) is in the tank 20 hours after the storm begins?</p>															
<p>____ Ans: 148.851</p> <p>A grocery store has their new cereal Calculos™ on sale. For the first six hours the store is open, Calculos™ are removed from the shelf at a rate modeled for $0 \leq t \leq 6$ by $f(t) = 14 + 3t \sin\left(\frac{t^2}{3}\right)$. 2 hours after opening, employees add boxes to the shelf at a rate modeled by $g(t) = 5 + 3 \ln(t^3 + 2)$ for $2 \leq t \leq 6$. Is the number of boxes of Calculos™ increasing or decreasing at $t = 4$? Find the value at which the number of boxes is decreasing or increasing per hour to advance.</p>	<p>____ Ans: 149.302</p> <p>Water is entering a pond from the north inlet. Water is exiting from the south outlet. Rates sampled from both at specific times are shown below. Use left-hand Riemann sums to approximate the net change in the pond's water volume (liters) over the 20 minutes sampled.</p> <table><tr><td>t (minutes)</td><td>0</td><td>8</td><td>14</td><td>20</td></tr><tr><td>North Inlet (l/min)</td><td>4200</td><td>4800</td><td>3800</td><td>4400</td></tr><tr><td>South Outlet (l/min)</td><td>5000</td><td>4800</td><td>4600</td><td>4900</td></tr></table>	t (minutes)	0	8	14	20	North Inlet (l/min)	4200	4800	3800	4400	South Outlet (l/min)	5000	4800	4600	4900
t (minutes)	0	8	14	20												
North Inlet (l/min)	4200	4800	3800	4400												
South Outlet (l/min)	5000	4800	4600	4900												
<p>____ Ans: -17.318</p> <p>The rate of a snowfall on a driveway is modeled in inches/hour by $s(t) = \frac{1}{4} \ln(4 + 2 \cos t)$ where t is hours since 7:00 am. At 9:00 am, Mike begins removing snow at a rate modeled by $m(t) = 1$ inches/hour. If there was no snow on the driveway at 7:00 am and snow stops falling at 10:00 am, how many inches of snow remain for Mike to remove?</p>	<p>____ Ans: 100</p> <p>From the time a facility processing sand for sandboxes opens, sand is brought in at a constant rate of 500 lbs/hour. Sand is filtered, sanitized, and packaged. The play sand ships out at a rate modeled by $s(t) = 395 - 2t \cos\left(\frac{1}{2}t\right)$ with t in hours and s in pounds/hr. How much sand has been shipped 4 hours after the facility has opened?</p>															

Mobius Training – Rate In/Rate Out

<p>____ Ans: 0.010</p> <p>A segment of pipe contains a blockage and 14 gallons of water at time $t = 0$. Water is draining from one end of the pipe at 7 gallons per hour. After 1 hour, water begins entering the pipe at the opposite end at a rate of 9 gallons per hour. How much water is in the pipe (in gallons) at time $t = 2.5$?</p>	<p>____ Ans: -11,200</p> <p>Sweet tea is being brewed by workers at a restaurant at a constant rate of 1,920 oz an hour during peak business hours. At the start of peak hours, there are 960 oz of tea already made. Customers are known to be served tea at the rates given below. Use a right-hand Riemann sum to approximate how much tea is available in ounces after the 4 hour peak period.</p> <table><tr><td>t (hours)</td><td>0</td><td>1</td><td>2</td><td>4</td></tr><tr><td>Serving (oz/hour)</td><td>2000</td><td>1800</td><td>2100</td><td>2000</td></tr></table>	t (hours)	0	1	2	4	Serving (oz/hour)	2000	1800	2100	2000
t (hours)	0	1	2	4							
Serving (oz/hour)	2000	1800	2100	2000							
<p>____ Ans: 1,576.780</p> <p>A tank is having a liquid pumped in at a rate modeled by $p(t) = t + 1 - \frac{2}{t+2}$ gallons/hour (t is in hours) and is releasing the liquid at a rate modeled by $d(t) = 1.5 \ln(t + 1)$ gallons/hour. After 20 hours what is the net change in the volume of the liquid in the tank in gallons?</p>	<p>____ Ans: 10</p> <p>At the start of the workday ($t = 0$), a factory has a surplus of 140 spinning toys. During a seven-hour shift, they manufacture spinning toys at a rate modeled by $s(t) = 15 - e^{\sin(2t)}$ in toys/hr. They ship out toys at a rate modeled by the function $m(t) = 30 + \ln(5 + \cos(3t))$. What is the rate of change in toys/hr of the inventory of toys in the factory at $t = 6$?</p>										
<p>____ Ans: 13.329</p> <p>At a school professional development, a generous administration provided coffee at rate modeled by $c(t) = 30$ for $0 \leq t \leq 5$ (cups per hour). Teachers are drinking the coffee at a rate modeled by $d(t) = 25 - \frac{1}{15}t^2 + 10 \cos(2t)$ for $0 \leq t \leq 5$. Find how the rate of change of the amount of coffee available is decreasing at $t = 3$. Identify units and find the numerical value to proceed.</p>	<p>____ Ans: 740</p> <p>A spherical tank is being filled at a rate modeled by $f(t) = \frac{1}{5}t^2 - 6 \sin\left(\frac{1}{2}t - 3\right) + 4$ for $0 \leq t \leq 10$. At $t = 2$, the tank starts leaking at a rate modeled by $g(t) = e^{\cos t} + 7$ for $2 \leq t \leq 10$. What is the volume of the tank at $t = 10$ if the volume at $t = 0$ was 100?</p>										