Name________________________________

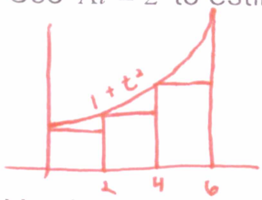


# Riemann Sums

1. Suppose time, *t*, is given in seconds and your velocity, *v*, in $\frac{\text{m}}{\text{sec}}$, is given by

$$v(t) = 1 + t^2 \text{ for } 0 \le t \le 6,$$

Use $\Delta t = 2$ to estimate the distance traveled during this time. Find the left-hand sum.




$(2)(1+0^2) + 2(1+2^2) + 2(1+4^2)$   m/s · s = (m)

b·h + b·h + b·h

2(1) + 2(5) + 2(17)

2. You jump out of an airplane. Before your parachute opens, you fall faster and faster but your acceleration decreases as you fall because of air resistance. The table gives you acceleration, *a* in $m/s^2$, after *t* seconds.

| *t* | 0 | 1 | 2 | 3 | 4 | 5 | s |
|---|---|---|---|---|---|---|---|
| *A* | 9.81 | 8.03 | 6.53 | 5.38 | 4.41 | 3.61 | $m/s^2$ |

Give the upper estimate of your speed for the first 5 seconds if $n = 5$. Set up the solution, but you do not need to solve.

$m/s^2 \cdot s = m/s$     34.16

3. When an aircraft attempts to climb as rapidly as possible, it climbs rate decreases with altitude. (This occurs because the air is less dense at higher altitudes.) The table shows performance data for a certain single-engine aircraft.

| **Altitude (1000 ft)** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Climb rate (ft/min)** | 925 | 875 | 830 | 780 | 730 | 685 | 635 | 585 | 535 | 490 | 440 |

Set up the Riemann sum for the midpoint estimate for the time required for this aircraft to climb from sea level to 10,000 ft if $n = 5$.

$\frac{ft}{min} \cdot ft = ft^2/min$ ↑ not time

Need to do reciprocal's of ft/min so we have

(min/ft) · (ft)

4. Use right-hand Riemann sums to estimate the total distance covered in 10 minutes. Set up the approximations, but no need to solve.

| Time (minutes) | 0 | 1.5 | 2 | 4 | 6.5 | 7 | 9 | 9.4 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| Velocity (ft/min) | 120 | 180.6 | 241 | 360 | 480 | 500 | 515 | 605 | 650 |

ft/min · min = ft