Estimating Area and Applications Notes NAME____

1) Estimate $\int_0^4 f(x)\,dx$ when $f(x) = \frac{1}{4}x^3 - 5$ using 4 equal subintervals.

   a. Left:

   b. Right:

   c. Trapezoidal:

   d. Midpoint:

t (minutes)	0	12	20	24	40
$v(t)$ (meters per minute)	0	200	240	–220	150

Johanna jogs along a straight path. For $0 \le t \le 40$, Johanna's velocity is given by a differentiable function v. Selected values of $v(t)$, where t is measured in minutes and $v(t)$ is measured in meters per minute, are given in the table above.

2) Use the data in the table to estimate the value of $v'(16)$. Using correct units, explain the meaning of $v'(16)$ in the context of the problem.

3) Using correct units, explain the meaning of the definite integral $\int_0^{40} v(t)\,dt$ in the context of the problem. Approximate the value of $\int_0^{40} v(t)\,dt$ using a LEFT Riemann sum with the four subintervals indicated in the table.

4) Using correct units, explain the meaning of the definite integral $\frac{1}{40}\int_0^{40} v(t)\,dt$ in the context of the problem. Approximate the value of $\frac{1}{40}\int_0^{40} v(t)\,dt$ using a RIGHT Riemann sum with the four subintervals indicated in the table.

5) Using correct units, explain the meaning of the definite integral $\int_0^{40} |v(t)|\,dt$ in the context of the problem. Approximate the value of $\int_0^{40} |v(t)|\,dt$ using a TRAPEZOIDAL approximation with the four subintervals indicated in the table.

The rate at which rainwater flows into a drainpipe is modeled by the function R, where $R(t) = 20\sin\left(\frac{t^2}{35}\right)$ cubic feet per hour, t is measured in hours, and $0 \le t \le 8$. [Calculator Active]

6) Find $R(3)$ and explain what it means in the context of the problem.

7) Find $R'(3)$ and explain what it means in the context of the problem.

8) Find $\int_0^8 R(t)\,dt$ and explain what it means in the context of the problem.

9) Find $\frac{1}{8}\int_0^8 R(t)\,dt$ and explain what it means in the context of the problem.