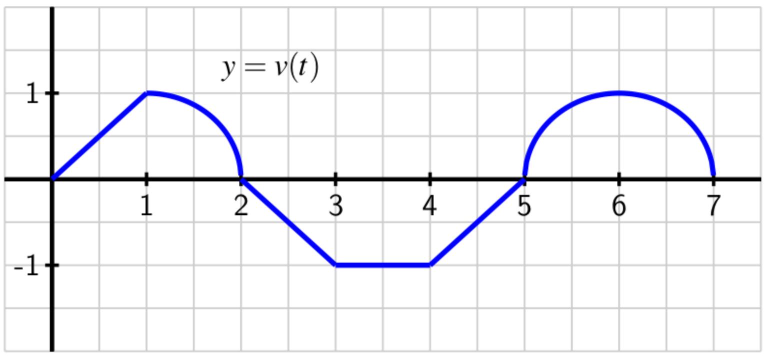
M124
Fall 2023

Quiz 6

Name:______________

No notes are allowed, but you may use a calculator for numerical work only (no graphing). Be sure to show all your work- your reasoning is very important.

1. Consider the graph of velocity given below, and assume the curves are straight lines or portions of circles.



   (a) Find the object's position at times $t = 2, 4, 6$:

   (b) If $s(t)$ is the position function, what is the value of $s(5) - s(2)$?

   (c) On which time interval(s) is the **position** function $s(t)$ increasing?

   (d) At which point(s) does the **position** function $s(t)$ achieve a local maximum?

2. For each sum written in sigma notation, expand the sum out (you don't need to evaluate the sum). For each sum written in expanded form, write using sigma notation.

   (a) $\sum_{k=1}^{4} 3 =$

   (b) $1 + 2 + 4 + 8 + 16 + 32 =$

   (c) $\sum_{j=3}^{6} (-1)^j j^2 =$

   (d) $\frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \frac{4}{5} + \cdots + \frac{10}{11} =$

3. A car traveling along a straight road is braking and its velocity is measured at several different points in time, as given in the following table, where t is measured in seconds and $v(t)$ is measured in feet/sec.

t	0	0.3	0.6	0.9	1.2	1.5	1.8
$v(t)$	100	88	74	59	40	19	0

(a) Estimate the total distance traveled during the car the time brakes using a middle Riemann sum with 3 subintervals. You may leave the sum unevaluated.

(b) Estimate the total distance traveled on $[0, 1.8]$ by writing the sums for L_6 and R_6. You may leave the sums unevaluated.

4. Consider $f(x) = x^2$ on the interval $[2, 4]$.

(a) Estimate the area under the curve by using 4 rectangles, and write the sum for R_4. You can leave the sum unevaluated.

(b) Will R_4 be an overestimate or underestimate?

5. If $\int_0^{10} f(x)\,dx = 8$ and $\int_0^{6} f(x)\,dx = 5$, then compute the following using properties of the definite integral:

   (a) $\int_{10}^{0} f(x)\,dx =$

   (b) $\int_0^{10} 2f(x)\,dx =$

   (c) $\int_6^{10} f(x)\,dx =$

6. Use the Fundamental Theorem of Calculus to evaluate the following definite integrals. Note that sometimes you'll need to do some algebra first.

   (a) $\int_{-1}^{1} (3x^2 - 2x)\,dx =$

   (b) $\int_1^{3} \frac{x^2 - x}{x}\,dx =$

   (c) $\int_1^{4} \sqrt{x}\,dx =$

   (d) $\int_0^{\pi/2} \cos(x)\,dx =$