Math 142
Spring, 2006
Quiz 22 - §§5.1, 5.2

Name: **Solutions**

Complete the following problems. Show all work to receive full credit.

1. An object is dropped straight down from a helicopter. The object falls faster and faster but is acceleration decreases over time because of air resistance. The acceleration is measured in ft/sec^2 and recorded every second after the drop for 5 seconds as shown:

t	0	1	2	3	4	5
$a(t)$	32.00	19.41	11.77	7.14	4.33	2.63

   Find an upper estimate for the speed when $t = 5$. Use $\Delta t = 1$.

   Since we want the upper estimate and the numbers are decreasing, we use the left-hand estimate.

time interval	$a(t)$	Δt	speed
$0 \le t \le 1$	32	1	32
$1 \le t \le 2$	19.41	1	19.41
$2 \le t \le 3$	11.7	1	11.7
$3 \le t \le 4$	7.14	1	7.14
$4 \le t \le 5$	4.33	1	4.33
Total			74.58

   So the velocity is ≈ 74.58 ft/sec

2. Find $\displaystyle\sum_{k=1}^{4} \cos(k\pi)$

$$= \cos(\pi) + \cos(2\pi) + \cos(3\pi) + \cos(4\pi) = -1 + 1 - 1 + 1 = 0$$

3. Suppose that $\displaystyle\sum_{k=1}^{n} a_k = -5$ and $\displaystyle\sum_{k=1}^{n} b_k = 6$. Find the following:

   (a) $\displaystyle\sum_{k=1}^{n} (a_k + b_k)$

$$= \sum_{k=1}^{n} a_k + \sum_{k=1}^{n} b_k = -5 + 6 = 1$$

   (b) $\displaystyle\sum_{k=1}^{n} \left(\frac{b_k}{6}\right)$

$$= \frac{1}{6} \sum_{k=1}^{n} b_k = \frac{1}{6} \cdot 6 = 1$$