AP Calculus
Test #6
Answer Key & Rubrics

Raw Score to Percentage Conversion

18	100%
16 – 17.9	95%
15 – 15.9	90%
13 – 14.9	85%
11 – 12.9	80%
9 – 10.9	75%
7 – 8.9	70%
5 – 6.9	65%
0 – 4.9* (With serious attempt)	60%

Multiple Choice

Calculator Permitted

		*
1.	**C**	**E**
2.	**E**	**A**
3.	**A**	**C**
4.	**D**	**C**
5.	**D**	**B**
6.	**D**	**B**
7.	**A**	**C**

Calculator NOT Permitted

		*
1.	**D**	**A**
2.	**C**	**E**
3.	**E**	**B**
4.	**D**	**E**
5.	**C**	**E**
6.	**D**	**B**
7.	**B**	**A**

Calculator NOT Permitted Free Response Part A – 3 point total

____ 1 $\frac{1}{30}\int_0^{30} v(t)dt \approx \frac{1}{30}(6)(7.5+12.5+13.5+14+13) = 12.1$ meters per second

____ 1 Uses correct units of meters per second

____ 1 The value of $\frac{1}{30}\int_0^{30} v(t)dt$ represents the average velocity during the first 30 seconds.

Calculator NOT Permitted Free Response Part B – 1 point total

____ 1 Average Acceleration = $\frac{v(18)-v(6)}{18-6} = \frac{14.1-10.1}{12} = \frac{4}{12} = \frac{1}{3}$ m/sec^2

Calculator NOT Permitted Free Response Part C – 3 points total

____ 1 $v'(6) \approx \frac{v(9)-v(3)}{9-3} = \frac{12.5-7.5}{6} = \frac{5}{6}$ m/sec^2

____ 1 $v'(6)$ represents the acceleration of the particle at $t = 6$ seconds.

____ 1 Since $v(6)$ and $v'(6)$ have the same sign, then the speed of the particle is increasing at $t = 6$.

Calculator NOT Permitted Free Response Part D – 2 points total

____ 1 The particle has a negative acceleration on the interval (20, 30) because…

____ 1 …velocity is decreasing on this interval.

Calculator Permitted Free Response Part A – 2 points total

____ 1 Correct setup: $15\cdot\int_9^{17} E(t)dt + 11\cdot\int_{17}^{23} E(t)dt$

____ 1 Correct answer: $104,048

Calculator Permitted Free Response Part B – 4 points total

____ 1 $H(17) = \int_9^{17}\left(E(t) - L(t)\right)dt = 3725 \text{ people}$

____ 1 $H(17)$ means that at 5 p.m., there are 3725 people in the park.

$H'(t) = E(t) - L(t)$
____ 1 $H'(17) = E(17) - L(17)$
$H'(17) = -380.281 \text{ people per hour}$

____ 1 Since $H'(17) < 0$, the number of people in the park is decreasing at a rate of 380 people per hour.

Calculator Permitted Free Response Part C – 3 points total

____ 1 $H'(t) = E(t) - L(t) = 0$ when $E(t) = L(t)$ which will occur when $t = 15.794815$

____ 1 Correctly finds the value of $H(9)$, $H(15.794815)$, and $H(23)$

$H(9) = 0$

$H(15.794815) = \int_9^{15.794}\left(E(t) - L(t)\right)dt = 3950.680$

$H(23) = \int_9^{23}\left(E(t) - L(t)\right)dt = 1.014$

____ 1 According to the Extreme Value Theorem, the maximum number of people in the park at any given time is approximately 3950 or 3951 people.