Math 1A Fall 2001: Section 2.1 Solutions

2. (a) Slope $= \frac{2948-2530}{42-36} = \frac{418}{6} \approx 69.67$ (b) Slope $= \frac{2948-2661}{42-38} = \frac{287}{4} = 71.75$

(c) Slope $= \frac{2948-2806}{42-40} = \frac{142}{2} = 71$ (d) Slope $= \frac{3080-2948}{44-42} = \frac{132}{2} = 66$

From the data, we see that the patient's heart rate is decreasing from 71 to 66 heartbeats/minute after 42 minutes. After being stable for a while, the patient's heart rate is dropping.

4. For the curve $y = \ln x$ and the point $P(2, \ln 2)$:

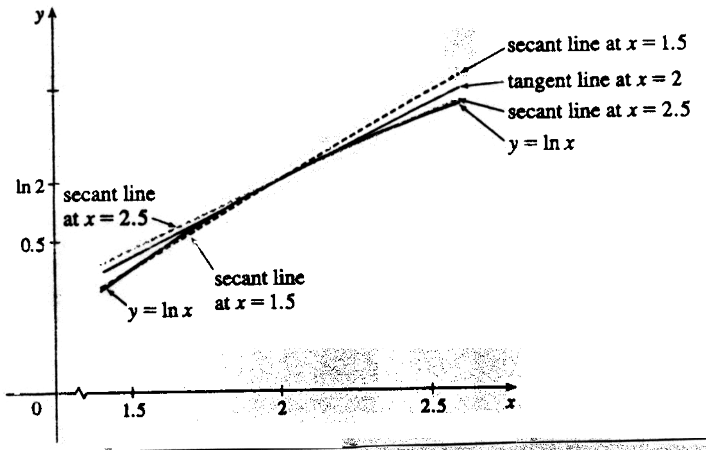
(a)

	x	Q	m_{PQ}
(i)	1.5	(1.5, 0.405465)	0.575364
(ii)	1.9	(1.9, 0.641854)	0.512933
(iii)	1.99	(1.99, 0.688135)	0.501254
(iv)	1.999	(1.999, 0.692647)	0.500125
(v)	2.5	(2.5, 0.916291)	0.446287
(vi)	2.1	(2.1, 0.741937)	0.487902
(vii)	2.01	(2.01, 0.698135)	0.498754
(viii)	2.001	(2.001, 0.693647)	0.499875

(b) The slope appears to be $\frac{1}{2}$.

(c) $y - \ln 2 = \frac{1}{2}(x-2)$ or
$y = \frac{1}{2}x - 1 + \ln 2$

(d)



6. The average velocity between t and $t+h$ seconds is

$$\frac{58(t+h) - 0.83(t+h)^2 - (58t - 0.83t^2)}{h} = \frac{58h - 1.66th - 0.83h^2}{h} = 58 - 1.66t - 0.83h \text{ if } h \neq 0.$$

(a) Here $t = 1$, so the average velocity is $58 - 1.66 - 0.83h = 56.34 - 0.83h$.

(i) $[1, 2]$: $h = 1$, 55.51 m/s (ii) $[1, 1.5]$: $h = 0.5$, 55.925 m/s

(iii) $[1, 1.1]$: $h = 0.1$, 56.257 m/s (iv) $[1, 1.01]$: $h = 0.01$, 56.3317 m/s

(v) $[1, 1.001]$: $h = 0.001$, 56.33917 m/s

(b) The instantaneous velocity after 1 second is 56.34 m/s.

8. Average velocity between times $t = 2$ and $t = 2 + h$ is given by $\frac{s(2+h) - s(2)}{h}$.

(a) (i) $h = 3 \Rightarrow v_{av} = \frac{s(5) - s(2)}{5-2} = \frac{178-32}{3} = \frac{146}{3} \approx 48.7$ ft/s

(ii) $h = 2 \Rightarrow v_{av} = \frac{s(4) - s(2)}{4-2} = \frac{119-32}{2} = \frac{87}{2} = 43.5$ ft/s

(iii) $h = 1 \Rightarrow v_{av} = \frac{s(3) - s(2)}{3-2} = \frac{70-32}{1} = 38$ ft/s

(b) Using the points $(0.8, 0)$ and $(5, 118)$ from the approximate tangent line, the instantaneous velocity at $t = 2$ is about $\frac{118-0}{5-0.8} \approx 28$ ft/s.