d $\int_0^3 r(t)\,dt = 973$

t (hours)	0	1	3	4	7	8	9
$L(t)$ (people)	120	156	176	126	150	80	0

2. Concert tickets went on sale at noon $(t = 0)$ and were sold out within 9 hours. The number of people waiting in line to purchase tickets at time t is modeled by a twice-differentiable function L for $0 \le t \le 9$. Values of $L(t)$ at various times t are shown in the table above.

(a) Use the data in the table to estimate the rate at which the number of people waiting in line was changing at 5:30 P.M. $(t = 5.5)$. Show the computations that lead to your answer. Indicate units of measure.

(b) Use a trapezoidal sum with three subintervals to estimate the average number of people waiting in line during the first 4 hours that tickets were on sale.

(c) For $0 \le t \le 9$, what is the fewest number of times at which $L'(t)$ must equal 0 ? Give a reason for your answer.

(d) The rate at which tickets were sold for $0 \le t \le 9$ is modeled by $r(t) = 550te^{-t/2}$ tickets per hour. Based on the model, how many tickets were sold by 3 P.M. $(t = 3)$, to the nearest whole number?

a $\dfrac{150-126}{7-4} = 8$ people/hR

b $\dfrac{(\frac{1}{2})(120+156)(1) + (\frac{1}{2})(156+176)(2) + (\frac{1}{2})(176+126)(1)}{4-0}$

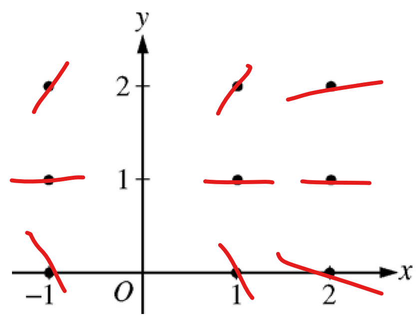
c 3 times L(t) changes inc to dec and then dec ~~to~~ inc, then ~~to~~ inc to dec

and L(t) changes inc → dec or dec → inc if $L'(t)=0$. IVT

5. Consider the differential equation $\frac{dy}{dx} = \frac{y-1}{x^2}$, where $x \neq 0$.

   (a) On the axes provided, sketch a slope field for the given differential equation at the nine points indicated.

   (Note: Use the axes provided in the exam booklet.)



   (b) Find the particular solution $y = f(x)$ to the differential equation with the initial condition $f(2) = 0$.

   (c) For the particular solution $y = f(x)$ described in part (b), find $\lim_{x \to \infty} f(x)$.

$$\frac{dy}{dx} = \frac{y-1}{x^2}$$

$$\int \frac{dy}{y-1} = \int \frac{1}{x^2}\,dx \rightarrow 1x^{-2}$$

$$\ln|y-1| = \frac{1}{-1}x^{-1} + c$$

$$\ln|0-1| = -\frac{1}{2} + c$$

$$0 = -\frac{1}{2} + c$$

$$c = \frac{1}{2}$$

$$\ln|y-1| = -\frac{1}{x} + \frac{1}{2}$$

e^ e^

$$y - 1 = -e^{-\frac{1}{x} + \frac{1}{2}}$$

$$\boxed{y = -e^{-\frac{1}{x} + \frac{1}{2}} + 1}$$

(c) $\lim_{x \to \infty} f(x) = -e^{\frac{1}{2}} + 1$

END OF EXAM