Answers Practice Math 1330 1 Nov 2006

4(d) $y = a e^{-t/t_0}$ for $0 \le t \le 10 t_0$.

$$\frac{dy}{dt} = a e^{-t/t_0}\left(-\frac{1}{t_0}\right) = -\frac{a}{t_0} e^{-t/t_0}$$

But $\frac{dy}{dt} \neq 0$ for *any* t.

Hence extrema must be at endpoints:

t	y	
0	a	← maximum
$10t_0$	ae^{-10}	← minimum

4(d) Plug in $t_0 = 5$ and $a = 0.2$ so

maximum at $t = 0$, $y = 0.2$

minimum at $t = 50$, $y = 9.08 \times 10^{-10}$

4(f) $y = a t e^{-t/t_0}$ we did in class → see notes

4(e) Plug in $a = 0.2$ and $t_0 = 5$ to get max at $t = 5$, $y = 0.368$

4(h) $y = e^{-(x-a)^2/2}$ $\quad \frac{dy}{dx} = e^{-(x-a)^2/2} \cdot \{-(x-a)\}$

$\Rightarrow \frac{dy}{dx} = 0$ when $x = a$. $\quad \frac{d^2y}{dx^2} = e^{-(x-a)^2/2}\{-(x-a)\}\{-(x-a)\} + e^{-(x-a)^2/2}\{-1\}$

$\frac{d^2y}{dx^2} = \left[(x-a)^2 - 1\right] e^{-(x-a)^2/2}$ When $x = a$ $\frac{d^2y}{dx^2} < 0$ hence concave down hence $x = a$ is a maximum, and $y = 1$ at maximum.

4(g) Just set $a = 14$, so at $x = 14$ max with $y = 1$.