CPN 321 Semester test 2 2011 Name: Cronje, C

Q1

① $\bar{x}\frac{dy'}{dt} + \bar{y}\frac{dx'}{dt} = x'(4\bar{x} - \frac{3\bar{y}}{\bar{x}^2}) + y'(3/\bar{x})$ ☑

$\frac{dy'}{dt} = x'(1/2) + y'\left(\frac{1}{2\sqrt{\bar{y}}}\right)$ ☐

perturbations ☑

3/4

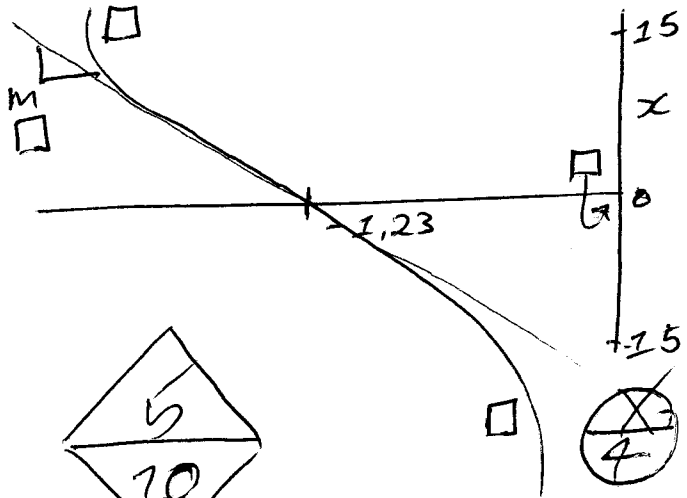
② $\begin{bmatrix} \bar{x} & \bar{y} \\ 1 & \end{bmatrix}\begin{bmatrix} \dot{y}' \\ \dot{x}' \end{bmatrix} = \begin{bmatrix} 4\bar{x} - \frac{3\bar{y}}{\bar{x}^2} & 3/\bar{x} \\ 1/2 & 1/2\sqrt{\bar{y}} \end{bmatrix}\begin{bmatrix} x' \\ y' \end{bmatrix}$

☑ ☑

2/2

3) $2x^2 + \frac{3y}{x}$

$= 2x^2 + 3.72/x$



☐ ☐

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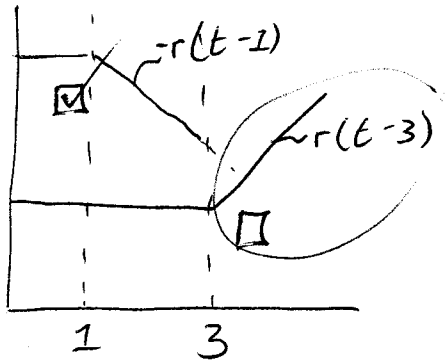
Q2

① $\frac{dh}{dt} = 3Fin - 2h + 1$

$\rightarrow h_0 = 5$ ☐

1

② 

☑ ☐

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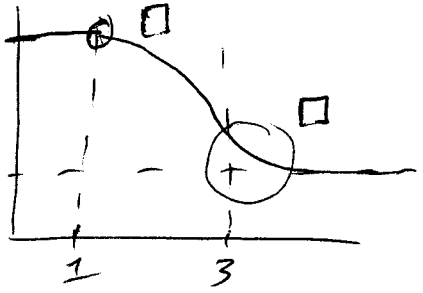
Fin = (3) r(t-1) + r(t-3) ☐

③ 

☐ ☐

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④ solution form: $k_p k_f(t/\tau_p + 1 + e^{-t/\tau_p})$

$f(t)$ ☐

$h = \begin{cases} 5 & \text{for } t < 1 \\ -f(t-1) & \text{for } 1 < t < 3 \\ -f(t-1) + f(t-3) & \text{for } 3 < t \end{cases}$ ☐ ☐ ☐

X/4

2/10

Q3

① $\frac{d^2T}{dt} = ka\frac{df}{dt}$ ☐

$= ak\left(\frac{dT}{dt} + b(T - T_s)\right)$

$\frac{d^2T}{dt} - ak\frac{dT}{dt} - akbT = -akT_s$ ☐

✓/2

② $-\frac{1}{akb}\frac{d^2T}{dt} + \frac{1}{b}\frac{dT}{dt} + T = \frac{1}{b}T_s$

$\tau^2 = -\frac{1}{akb} \Rightarrow \tau = \pm\sqrt{\frac{1}{akb}}$ ☑

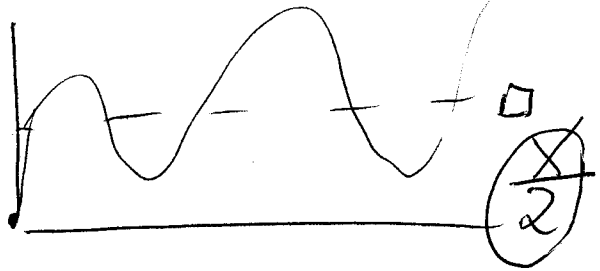
$2\xi\tau = 1/b \Rightarrow \xi = \frac{\sqrt{akb}}{2b}$ ☑

(2) stability: $\xi > 0$ ☐

$\Rightarrow k < 0$ ☐

2/4

③ unstable ☐



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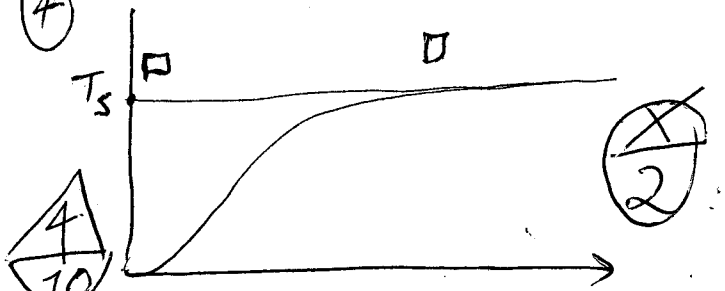
④ 

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X/2

4/10

11/30 = 37 %