ODEs - 104285. Semester: Spring. Year: 2011

HW-9. You should do it by June 22

No complex numbers in the final answers!

1. Let $y(t) = e^{2t} cos(5t)$.

a. Find $P(\frac{d}{dt})(y(t))$ if $P(\lambda) = \lambda^3 - 2\lambda^2 + \lambda - 1$

b. Let $P(\lambda) = Q(\lambda)(\lambda^2 - 4\lambda + a)$. Find $a \in \mathbb{R}$ such that $P(\frac{d}{dt})(y(t)) = 0$ for **any** polynomial $Q(\lambda)$.

2. Find the set of all solutions of the following equations:

2.1. $y''''''''''(t) = y(t)$ (the 10-th derivative of $y(t)$ is equal to $y(t)$)

2.2. $y'''''''(t) + y(t) = 0$ (the 7-th derivative of $y(t)$ plus $y(t)$ is 0).

2.3. $y'''(t) + y'(t) = sint + 1$

2.4. $P(\frac{d}{dt})(x(t)) = e^t, \quad P(\lambda) = (\lambda^2 + 1)^4$

2.5. $P(\frac{d}{dt})(x(t)) = e^t, \quad P(\lambda) = (\lambda^2 - 1)^4$

2.6 $P(\frac{d}{dt})(x(t)) = cost, \quad P(\lambda) = (\lambda^2 - 1)^4$

2.7. $P(\frac{d}{dt})(x(t)) = sint, \quad P(\lambda) = (\lambda^2 + 1)^4(\lambda + 1)$

2.8. $P(\frac{d}{dt})(y(t)) = e^t sint + e^{2t} cos(3t) + cos(3t) + e^{4t}$, where
$P(\lambda) = (\lambda^2 - 2\lambda + 2)^7(\lambda^2 - 4\lambda + 13)^9$