MATH 246 Homework 2.4
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## Directions:

- Work should be done neatly and on separate paper.
- Enough work must be shown so that the steps you are taking is clear.

1. Find fundamental sets of solutions for each of the following differential equations. Feel free to use software (like Wolfram Alpha) to factor poynomials if needed. Then write down the general solution.
(a) $y^{\prime \prime}+8 y^{\prime}+7 y=0$
(b) $2 y^{\prime \prime}+3 y^{\prime}+4 y=0$
(c) $3 y^{\prime \prime}+2 y=0$
(d) $y^{\prime \prime}+4 y^{\prime}+4 y=0$
(e) $D^{4} y+D^{3} y=0$
(f) $D^{5} y-3 D^{4} y+18 D^{3} y-54 D^{2} y+81 D y-243 y=0$
2. Solve the following initial value problems:
(a) $y^{\prime \prime}-2 y^{\prime}-15 y=0$ with $y(\ln 2)=3$ and $y^{\prime}(\ln 2)=4$.
(b) $y^{\prime \prime}+4 y=0$ with $y(\pi / 4)=2$ and $y^{\prime}(\pi / 4)=1$.
3. Describe as best you can the graphs of the following functions. Specifically what happens as $t \rightarrow \infty$, as $t \rightarrow-\infty$ and for $t$ near 0 ?
(a) $y=3 e^{t}+5 e^{3 t}$
(b) $y=2 \cos (5 t)-7 \sin (5 t)$
(c) $y=2 e^{t} \cos (5 t)+3 e^{t} \sin (5 t)$
(d) $y=2 e^{-0.02 t} \cos (3 t)+3 e^{-0.02 t} \sin (3 t)$
4. For each of the following sets, write down a differential equation for which the pair form a fundamental set of solutions:
(a) $\left\{e^{-t}, e^{6 t}\right\}$
(b) $\left\{e^{7 t} \cos (0.5 t), e^{7 t} \sin (0.5 t)\right\}$
(c) $\left\{e^{2 t}, t e^{2 t}\right\}$
(d) $\left\{1, t, t^{2}, t^{3}, \cos (t), \sin (t)\right\}$
