Assignment 5

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1 Problem Set 1

1.1 Problem 1

1) $f(t) = e^{2^{t^2}}$
This function is not exponential order. For some K, c, T,

$$\frac{e^{2^{t^2}}}{Ke^{ct}} = \frac{1}{K}e^{2^{t^2}-ct}$$

As t approaches infinity, the expression in the exponent approaches infinity regardless of our selection of c.

2) $f(t) = 2t^3$

$$\lim_{t\to\infty} \frac{2t^3}{Ke^{ct}} = \lim_{t\to\infty} \frac{6t^2}{cKe^{ct}} = \lim_{t\to\infty} \frac{12t}{c^2Ke^{ct}} = \lim_{t\to\infty} \frac{12}{c^3Ke^{ct}}$$

Evaluating this limit, we see that as t approaches infinity, the ratio approaches zero. Therefore $2t^3$ is of exponential order.

1.2 Problem 2

$$\frac{1}{s^2+6s+8}$$

Using partial fraction decomposition,

$$\frac{1}{s^2+6s+8} = \frac{A}{s+2} + \frac{B}{s+4}$$
$$1 = As + 4A + Bs + 2B$$

Comparing coefficients,

$$0 = A + B1 \qquad\qquad = 4A + 2B$$

We get $A = 1/2$ and $B = -1/2$. Substituting,

$$\frac{1}{s^2+6s+8} = \frac{1}{2(s+2)} + \frac{-1}{2(s+4)}$$

Taking the inverse Laplace transform,

$$f(t) = \frac{1}{2}e^{-2t} - \frac{1}{2}e^{-4t}$$

2 Problem Set 2

2.1 Problem 1

2.2 Problem 2