ME 2801, HW2, Inverse Laplace Transform

Partial fraction expansion with complex roots

F(s)

```
num = [1 5];
den = conv([1 2],[1 0 36])
```

```
den = 1×4
     1     2    36    72
```

```
[R1,P1,K1] = residue(num,den)
```

```
R1 = 3×1 complex
  -0.0375 - 0.0958i
  -0.0375 + 0.0958i
   0.0750 + 0.0000i
P1 = 3×1 complex
   0.0000 + 6.0000i
   0.0000 - 6.0000i
  -2.0000 + 0.0000i
K1 =
     []
```

Using the handout on Partial Fraction Expansion with Complex Roots

$$a = 0, \omega = 6, \alpha = -0.0375, \beta = 0.0958$$

$$F(s) = \frac{2(-0.0375)s}{s^2 + 6^2} + \frac{2(0.0958)(6)}{s^2 + 6^2} + \frac{0.075}{s + 2}$$

$$f(t) = 2[-0.0375cos(6t) + 0.0958sin(6t)] + 0.075e^{-2t}$$

G(s)

```
num = 2;
den = [1 1 16.25 0];
[R2,P2,K2] = residue(num,den)
```

```
R2 = 3×1 complex
  -0.0615 + 0.0077i
  -0.0615 - 0.0077i
   0.1231 + 0.0000i
P2 = 3×1 complex
  -0.5000 + 4.0000i
  -0.5000 - 4.0000i
   0.0000 + 0.0000i
K2 =
     []
```

$$a = 0.5, \omega = 4, \alpha = -0.0615, \beta = -0.0077$$

$$G(s) = 2\left[\frac{-0.0615(s+0.5) - 0.0077(4)}{(s+0.5)^2 + 4^2}\right] + \frac{0.1231}{s}$$

$$g(t) = 2e^{-0.5t}[-0.0615cos(4t) - 0.0077sin(4t)] + 0.1231$$

H(s)

```
num = 1;
den = conv([1 0 9],[1 4 1]);
[R3,P3,K3] = residue(num,den)
```

```
R3 = 4×1 complex
  -0.0126 + 0.0000i
  -0.0096 + 0.0064i
  -0.0096 - 0.0064i
   0.0318 + 0.0000i
P3 = 4×1 complex
  -3.7321 + 0.0000i
   0.0000 + 3.0000i
   0.0000 - 3.0000i
  -0.2679 + 0.0000i
K3 =
     []
```

$$a = 0, \omega = 3, \alpha = -0.0096, \beta = -0.0064$$

$$H(s) = 2\left[\frac{-0.0096(s) - 0.0064(3)}{s^2 + 3^2}\right] + \frac{-0.0126}{s + 3.7321} + \frac{0.0318}{s + 0.2679}$$

$$g(t) = 2[-0.0096cos(3t) - 0.0064sin(3t)] - 0.0126e^{-3.7321t} + 0.0318e^{-0.2679t}$$