**Homework 12**

**P21.4.2** Determine the ILT of .

**Solution:** . Multiplying by *s* and setting *s* = 0 gives *K*1 = 10. Multiplying by (*s* + 2)2 and setting *s* = -2, gives *K*2 = -40. Multiplying out and equating numerators, . Comparing the coefficients of *s*2: 30 = 10 + *K*3, which gives *K*3 = 20. As a check, comparing the coefficients of *s*: 40 = 40 – 40 + 40. Comparing the constant term, 40 = 40. Taking the ILT, .

**P21.4.6** Determine the ILT of .

**Solution:** . Considering  =  =  + . Referring to Table 20.3.1, the ILT is  = .

**P21.4.11** Determine the ILT of .

**Solution:** . Multiplying by (*s* – 1)3 gives *K*1 = 1. Multiplying out and equating numerators, 1 = 1 + *K*2(*s* – 1) + *K*3(*s2* – 2*s* + 1). Since there is no *s*2 on the LHS, *K*3 = 0, and since there is no *s* on the LHS, *K*2 = 0. Hence, the ILT of  is .

. Multiplying by (*s* + 4) and setting *s* = -4 gives *K*1 = -1/6. Multiplying by (*s* – 2) and setting *s* = 2 gives *K*2 = 1/6. Hence, the ILT of  is . The complete ILT is: .

**P21.5.3** If , determine *f*(*t*) as *t* → ∞.

**Solution:** . The poles are at *s* = 1 ± *j,* in the right half of the plane, which means that the final-value theorem does not apply. These poles will make *f*(*t*) → ∞ as *t* → ∞.

**P21.5.6** If , determine *f*(0+).

**Solution:** Dividing numerator by denominator, . Applying the initial value theorem to the proper rational function, *f*(0+) = -10.

**P21.5.8** Determine the value of the convolution integral *y*(*t*) at *t* = 0.5 s, where *y*(*t*) = *f*(*t*)\**g*(*t*), with *f*(*t*) = sin*t*, and *g*(*t*) = 2*δ*(*t*) + *δ*(2)(*t*).

**Solution:** L, and L; ; . At *t* = 0.5 s, *y*(0.5) = sin0.5.