

# ASPC 6213 Analytical Method in Engineering III

## Homework 6 Question 3 - f

Zichao Hou

```
In [1]: import numpy
        from matplotlib import pyplot
        %matplotlib inline
        pyplot.rcParams['font.family'] = 'serif'
        pyplot.rcParams['font.size'] = 16
```

```
In [2]: # parameters
        L = 1.0
        D = 1.0
        pi = numpy.pi

        dx = 0.001 # step length
        nx = int(L/dx) + 1 # steps number
        x0 = numpy.linspace(0.0, L, num=nx)

        T = [0.001, 0.01, 0.1, 10.0] # different time value
```

```
In [3]: x = x0.copy()
        f_history = [x0.copy()]
        for t in T:
            f1 = x / L - (x / L)**2
            temp = 0.0
            for n in range(1, 2001):
                temp = temp + ((-1)**n - 1) / (n**3) * numpy.sin(n*pi*x/L) * numpy.exp
            (-D*((n*pi/L)**2)*t)
            f2 = 4 / (pi**3) * temp
            f = f1 + f2
            f_history.append(f)
```

```

In [4]: # plot
pyplot.figure(figsize=(12.0, 5.0))
pyplot.title('HW 6 Question 6-f')
pyplot.xlabel('x')
pyplot.ylabel(r'$\frac{T(x,t)-T^0}{QL^2/2k}$')
pyplot.grid()
pyplot.plot(x, f_history[1], label='t=0.001 s', linestyle='-', linewidth=2)
pyplot.plot(x, f_history[2], label='t=0.01 s', linestyle='--', linewidth=2)
pyplot.plot(x, f_history[3], label='t=0.1 s', linestyle=':', linewidth=2)
pyplot.plot(x, f_history[4], label='t=10.0 s', linestyle='-.', linewidth=2)
pyplot.legend();

```

