

## Math 2080: Differential Equations

### Worksheet 5.6: Convolution

NAME:

1. Let  $f(t) = \sin t$  and  $g(t) = t$ . In this problem, you will compute the convolution  $f * g$  two ways.

(a) Compute  $f * g$  directly from the definition:  $(f * g)(t) = \int_0^t f(u) g(t - u) du$ .

(b) Compute  $F(t) = \mathcal{L}(f)$  and  $G = \mathcal{L}(g)$  and then compute  $f * g = \mathcal{L}^{-1}\{\mathcal{L}(f)\mathcal{L}(g)\}$ .

2. Suppose you have an investment that grows at a constant 5% rate, compounded continuously, and you are depositing money into the account at a rate of  $d(t)$ . How much will the investment be worth at time  $t = x$ ?