

**Quiz 8, Math 246, Professor David Levermore**  
**Tuesday, 6 November 2018**

**Your Name:**

**Discussion Instructor (circle one):**            Sid Sharma            Anqi Ye  
**Discussion Time (circle one):**            8:00            9:00            10:00

**No books, notes, calculators, or any electronic devices.**  
**Show your reasoning for full credit. Good luck!**

**Short Table:**  $\mathcal{L}[t^n e^{at}](s) = \frac{n!}{(s-a)^{n+1}}$  for  $s > a$ ,       $\mathcal{L}[u(t-c)j(t-c)](s) = e^{-cs}\mathcal{L}[j](s)$ .

(1) [5] Find  $F(s) = \mathcal{L}[f](s)$  where  $f(t) = u(t-3)e^{-2t} + 4\delta(t-5)$ .

(2) [2] Transform the equation  $v'''' - e^{v'}v'' - \sin(t+v) = 0$  into a first-order system of ordinary differential equations.

(3) [3] Consider the matrix-valued function  $\Psi(t) = \begin{pmatrix} 1 & -2t^2 \\ t^2 & 4-t^4 \end{pmatrix}$ .

- (a) Compute  $\det(\Psi(t))$ .
- (b) Compute  $\Psi(t)^{-1}$ .
- (c) Compute  $\Psi'(t)$ .