1. (5 points) Determine the inverse Laplace transform of $\frac{1}{s(s-2)}$. (In other words, what function has Laplace transform equal to $\frac{1}{s(s-2)}$?)

**Solution:** There are at least two ways to do this. One uses the convolution theorem: the Laplace transform of 1 is $\frac{1}{s}$ and the Laplace transform of $e^{2t}$ is $\frac{1}{s-2}$, so the inverse Laplace transform of their product is

$$(1 \ast e^{2t})(t) = \int_0^t e^{2\tau} d\tau = \frac{1}{2}(e^{2t} - 1).$$

2. Suppose $A$ is a $4 \times 3$ matrix and $B$ is a $3 \times 5$ matrix.
   (a) (1 point) How many rows does the product $AB$ have?
   
   (a) 4

   (b) (1 point) How many columns does $AB$ have?

   (b) 5

3. (3 points) Compute the product $AB$ of the matrices $A$ and $B$, given by the following:

   $$A = \begin{pmatrix} 1 & 0 & 1 \\ 2 & -1 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 2 \\ 2 & -1 \\ 0 & 1 \end{pmatrix}$$

**Solution:** We compute:

$$AB = \begin{pmatrix} 1 & 0 & 1 \\ 2 & -1 & 1 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 2 & -1 \\ 0 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} 1 \cdot 1 + 0 \cdot 2 + 1 \cdot 0 & 1 \cdot 2 + 0 \cdot (-1) + 1 \cdot 1 \\ 2 \cdot 1 + (-1) \cdot 2 + 1 \cdot 0 & 2 \cdot 2 + (-1) \cdot (-1) + 1 \cdot 1 \end{pmatrix} = \begin{pmatrix} 1 & 3 \\ 0 & 6 \end{pmatrix}$$