Circle True or False or leave blank. (1 point for correct answer, -1 for incorrect answer, 0 if left blank)

1. **TRUE**   False The χ^2 distribution with $k = 2$ degrees of freedom is the same as an exponential distribution.

> **Solution:** When $k = 2$, the distribution is $\frac{1}{2^1\Gamma(1)}x^{1-1}e^{-x/2} = \frac{1}{2}e^{-x/2}$ which is an exponential distribution.

2. **TRUE**   False We can prove $\Gamma(s + 1) = s\Gamma(s)$ for all $s > 0$ by using integration by parts.

Show your work and justify your answers. Please circle or box your final answer.

3. (10 points) You wonder whether spoiling Avengers Endgame affects the rate at which you are punched. The data is given below. Can we conclude that they are dependent with a significance level of 1%?

	Didn't Spoil Avengers		Spoiled Avengers	
Punched	40		20	
Not Punched	60		80	

> **Solution:** The null hypothesis is that they are independent, and the alternative one is that they are dependent.
>
> The filled out table is:
>
> | | Didn't Spoil Avengers | | Spoiled Avengers | | |
> |---|---|---|---|---|---|
> | Punched | 40 | 30 | 20 | 30 | 60 |
> | Not Punched | 60 | 70 | 80 | 70 | 140 |
> | | 100 | | 100 | | |
>
> So the r value is
> $$r = \frac{10^2}{30} + \frac{10^2}{30} + \frac{10^2}{70} + \frac{10^2}{70} = \frac{200}{21}.$$
>
> There is 1 degree of freedom and the significance level is 0.01 so the critical value is 6.63. Then we see that $\frac{200}{21} \approx 9 > 6.63$ and so we reject the null hypothesis and say that they are dependent.