True/False - No explanation needed. (For each: 1 point if correct, 0 points if not answered, -1 points if incorrect)

1. Call f_k the PDF of χ_k^2. As k increases $f_k(0)$ decreases. True/False

   True. χ_k^2 is the sum of k independent random normal distributions squared, so the probability density of all of them being 0 at the same time must necessarily decrease.

2. $\Gamma(\frac{1}{2}) = \sqrt{2\pi}$ True/False

   False. By taking integrals, we can se $\Gamma(\frac{1}{2}) = \sqrt{\pi}$.

Problems - Needs justification.

1. I have a 4 sided die with sides 1-4, which I believe is fair. I roll it 100 times, obtain the four numbers in frequencies

Number	Frequency
1	35
2	15
3	30
4	20

   If my alternate hypothesis is that the die is not fair with confidence level $\alpha = 0.01$, can I reject my null hypothesis? (10 points)

   I add the difference from the observed frequency and the expected frequency. This gives me

   $$\frac{(35-25)^2}{25} + \frac{(15-25)^2}{25} + \frac{(30-25)^2}{25} + \frac{(20-25)^2}{25} = 10$$

   According to the χ^2 table, the critical value for $\alpha = .01$ and 3 degrees of freedom is 11.34. Therefore we cannot reject the null hypothesis.