Questions for recitation 27 January 2021

1. Find the partial fraction decomposition for:

$$\frac{x-29}{x^3(x^2-4)^2(x^2+x+16)^2}$$

2. Evaluate $\int \frac{x}{1+x^4}\,dx$

3. Evaluate $\int \frac{r^2}{r+4}\,dr$ (the fast way)

4. Evaluate $\int \frac{10}{x^3-x^2+9x-9}\,dx$

5. Evaluate $\int_0^1 \frac{2x^3+5}{x^4+5x^2+4}\,dx$

6. Evaluate $\int \frac{\cos x}{(1+\cos x)(1-\cos x)+\sin x}\,dx$

7. Let $k > 0$ and $0 < c < 1$ be constants. A rumour gets spread in town. The amount of time it takes until a fraction p of the town's population has heard the rumour is given by

$$t(p) = \int_c^p \frac{k}{x(1-x)}\,dx.$$

   (a) Evaluate the integral to find a formula for $t(p)$, in terms of a single log expression.

   (b) At time $t = 0$, one percent of the population has heard the rumour, and by time $t = 1$, half the population has heard the rumour. What are the values of c and k?