MAT 342, Quiz 4, 11/18

1. Write the Laurent series decomposition at $z_0 = 0$ of the function

$$f(z) = z^3 \cos\left(\frac{1}{z^2}\right).$$

In what domain does your series converge? Explain your answer.

Find the residue $\operatorname{Res}_{z=0} f(z)$ of the function f at 0. Explain your answer.

2. Find the Taylor series decomposition at $z_0 = 2$ for the function

$$g(z) = \frac{1}{z^3},$$

by computing the derivatives of the function. Do not simplify the expression for the coefficients of the series, so that the numerical pattern can be clearly seen. Please write down the four first non-zero terms of the Taylor series. In what domain does your series converge? Explain your answer.

PLEASE TURN OVER: QUESTION 3 ON BACK

3. Find the Laurent series decomposition at $z_0 = -1$ for the function

$$h(z) = \frac{1}{z(z+1)^2}.$$

Find the residue $\operatorname{Res}_{z=-1} h(z)$ of the function h at -1. Explain your answer.