

Please turn in the solutions on Monday, November 24, in class.

Question 1 (Qual Exam from January 2010, 2 pts). Let X, Y and Z be topological spaces and let $f_1: X \rightarrow Y, f_2: X \rightarrow Y, g_1: Y \rightarrow Z$ and $g_2: Y \rightarrow Z$ be continuous functions. Show that if f_1 is homotopic to f_2 and g_1 is homotopic to g_2 then $g_1 \circ f_1$ is homotopic to $g_2 \circ f_2$.

Question 2 (Qual Exam from January 2005, 2 pts). Let α and β be paths from x_0 to x_1 in a space X . If $\pi_1(X, x_0) = 0$, prove that $\alpha \simeq_p \beta$.

Question 3 (2 pts, 1 pt for each part). Problem 2 from section 51 in Munkres, page 330.

Question 4 (4 pts, 1 pt for each part). Problem 3 from section 51 in Munkres, page 330.