degree mod 2 of a mapping

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Suppose that M and N are two differentiable manifolds of dimension n (without boundary) with M compact and N connected and suppose that $f\colon M \to N$ is a differentiable mapping. If $y \in N$ is a regular value of f, then we denote by $\#f^{-1}(y)$ the number of points in M that map to y.

Definition. Let $y \in N$ be a regular value, then we define the *degree mod 2* of f by
$$\deg_2 f := \#f^{-1}(y) \pmod 2.$$

It can be shown that the degree mod 2 does not depend on the regular value y that we pick so that $\deg_2 f$ is well defined.

This is similar to the Brouwer degree but does not require oriented manifolds. In fact $\deg_2 f = \deg f \pmod 2$.

References

[1] John W. Milnor. . The University Press of Virginia, Charlottesville, Virginia, 1969.