A WKB-like approach to Unruh radiation ANDREA DE GILL, DOUGLAS SINGLETON, California State University, Fresno, VALERIA AKHME-DOVA, Institute of Theoretical and Experimental Physics, Moscow, TERRY PILLING, North Dakota State University, Fargo — Unruh radiation is the thermal flux seen by an accelerated observer moving through Minkowski spacetime. In this article, we study Unruh radiation as tunneling through a barrier. We discuss the metric of the observer that constantly accelerates in vacuum, usually called the Rindler observer, and discuss some of its subtleties. To obtain the tunneling rate and the temperature of the Unruh radiation, we use a WKB-like method. This derivation should be accessible to advanced undergraduate students or beginning graduate students. In addition, this gravitational WKB method helps to highlight some fine points of the WKB method as usually applied in quantum mechanics. First, the tunneling rate strictly should be written as the closed path integral of the canonical momentum. Second, for the case of the gravitational WKB problem, there is a time-like contribution to the tunneling rate arising from an imaginary change of the time coordinate upon crossing the horizon. This temporal contribution to the tunneling rate has no analog in the ordinary quantum mechanical WKB calculation.

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