

1. [10 points] A model¹ for the extinction rate of marine species during the Phanerozoic period (which extends from approximately 545 million years before the present until now) stipulates that this extinction rate, $r(t)$, in numbers of marine animal families per million years, is

$$r(t) = \frac{3130}{t + 262},$$

where t is the number of million years after the start of the Phanerozoic period.

- a. [5 points] Find an expression for $E(t)$, the number of extinctions that occurred between the start of the Phanerozoic period and t million years thereafter.

- b. [5 points] Find an expression for the average rate of extinctions between the start of the Phanerozoic period and t million years thereafter.

¹Newman & Eble, *Decline in Extinction Rates and Scale Invariance in the Fossil Record*, *Paleobiology* **25**:234–39 (1999)