

6. (5 points) Parasitoids are insects that lay eggs in, on, or close to other (host) insects. Their larvae then devour the host insect, resulting in the death of the host. The likelihood of escaping parasitism may depend on parasitoid density. One such model sets the probability, P , of escaping parasitism as:

$$P = f(D) = \left(1 + \frac{aD}{k}\right)^{-k}$$

where D is the parasitoid density and a and k are positive constants.

Determine whether the probability of escaping parasitism increases or decreases as parasitoid density increases. Justify your answer.

7. (12 points) Let $P = f(t)$ be the total amount, in trillions of barrels, of the world's reserves of petroleum in year t .

(a) What does the statement $f(2006) = 1.2$ tell you about the petroleum reserves?

(b) Evaluate and interpret $f^{-1}(1.2)$.

(c) What does the statement $f'(2006) = -0.003675$ tell you about the petroleum reserves?

(d) Evaluate and interpret $(f^{-1})'(1.2)$.