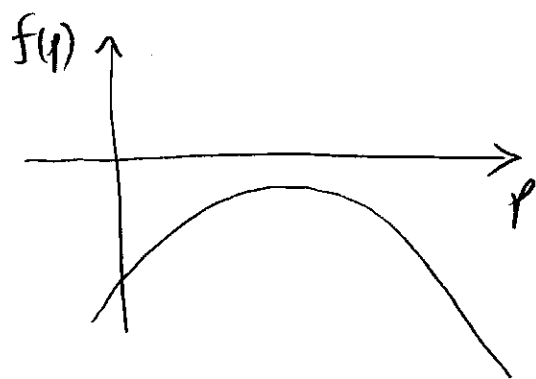


Equilibrium points are found from $f(p) = 5p^2 - p^2 - 8 = 0$ (2)

$$p^2 - 5p + 8 = 0 \Rightarrow p_{1,2} = \frac{5 \pm \sqrt{25 - 32}}{2}$$

No real solutions \Rightarrow no equilibrium points



$\Rightarrow f(p) < 0$ for any $p \Rightarrow$



Since $f(p) < 0$ for any p , the population will decrease and reach zero. That is, the fish will become extinct.

2. General ODE: $Ay'' + By' = Cy + De^{2t}y^2$

(a) (i) $A=0, B=1, C=1, D=2 \Rightarrow \frac{dy}{dt} = y + 2e^{2t}y^2$

$$\Rightarrow \frac{dy}{dt} - y = 2e^{2t}y^2$$

A Bernoulli equation with $n=2, p(t)=-1, q(t)=2e^{2t}$.

Use the substitution $v = y^{1-n} = y^{-1} = \frac{1}{y}$

This substitution leads to: $\frac{dv}{dt} + (1-n)p(t)v = (1-n)q(t)$