Let $y = 7e^{\frac{1}{2}x} - 3e^{-x}$

Find y'

$$y' = 7e^{\frac{1}{2}x} \cdot \frac{1}{2} - 3e^{-x} \cdot -1$$

$$= \frac{7}{2} e^{\frac{1}{2}x} + 3e^{-x}$$

Find y''

$$y'' = \frac{7}{2} e^{\frac{1}{2}x} \cdot \frac{1}{2} + 3e^{-x} \cdot -1$$

$$= \frac{7}{4} e^{\frac{1}{2}x} - 3e^{-x}$$

Is y a solution of $2y'' + y' - y = 0$

$$2\left(\frac{7}{4} e^{\frac{1}{2}x} - 3e^{-x}\right) + \left(\frac{7}{2} e^{\frac{1}{2}x} + 3e^{-x}\right) - \left(7e^{\frac{1}{2}x} - 3e^{-x}\right) = 0$$

$$\cancel{\frac{7}{2} e^{\frac{1}{2}x}} - \cancel{6e^{-x}} + \cancel{\frac{7}{2} e^{\frac{1}{2}x}} + \cancel{3e^{-x}} - \cancel{7e^{\frac{1}{2}x}} + \cancel{3e^{-x}} = 0$$

$$0 = 0$$

Yes

A population is modeled by the following differential equation:

$$\frac{dP}{dt} = 2.9P\left(1 - \frac{P}{9500}\right)$$

For what values of P is $\frac{dP}{dt} > 0$?

$\frac{dP}{dt} = 2.9P(1 - \frac{1}{9500}P)$

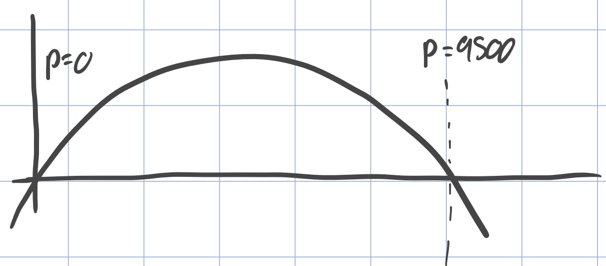
Find the roots

$0 = 2.9P(1 - \frac{1}{9500}P)$

$0 = 2.9P$ $\quad$ $0 = 1 - \frac{1}{9500}P$

$P = 0$ $\quad$ $P\frac{1}{9500} = 1$

$P = 9500$



Postive: $(0, 9500)$

For what values of $\frac{dP}{dt} < 0$?

Negative: $(-\infty, 0) \cup (9500, \infty)$

For what values of $\frac{dP}{dt} = 0$?

Zero: $x = 0$ and $x = 9500$

Use Euler's Method with a step size 0.2 to estimate $y(1)$, where $y(x)$ is the solution of the initial value problem.

$y' = x^2 + xy$

$y(0) = 2$

$x_{i+1} = x_i + \Delta x$

$y_{i+1} = y_i + f(x_i, y_i)\Delta x$

i	x_i	y_i	m	x_{i+1}	y_{i+1}
0	0	2	0	0.2	2
1	0.2	2	0.176	0.4	2.088
2	0.4	2.088	0.995	0.6	2.287
3	0.6	2.287	1.732	0.8	2.633
4	0.8	2.633	2.747	1	3.183
5	1	3.183			

Use Euler's method with a step size of 0.1 to estimate $y(0.4)$, where $y(x)$ is the solution of the initial value problem.

$y' = y - x^2$

$y(0) = 2$

i	x_i	y_i	m	x_{i+1}	y_{i+1}
0	0	2	2	0.1	2.2
1	0.1	2.2	2.19	0.2	2.419
2	0.2	2.419	2.379	0.3	2.657
3	0.3	2.657	2.567	0.4	2.914

4	0.4	2.914		

An object is thrown upwards with an initial velocity of 10 m/s from a height of 1 meter. Find the highest point the object reaches.

$V = 10 - 9.8t$

$P = \int v \, dt$

$P = 10t - \frac{9.8}{2}t^2 + C$

Initial Condition $t = 0$ $p = 1$

$1 = 10(0) - \frac{9.8}{2}(0)^2 + C$

$C = 1$

Final Equation

$P = 10t - \frac{9.8}{2}t^2 + 1$

Highest Point when $V = 0$

$0 = 10 - 9.8t$

$9.8t = 10$

$t = 1.02$

$P = 10(1.02) - \frac{9.8}{2}(1.02)^2 + 1$

$= 6.102$ m