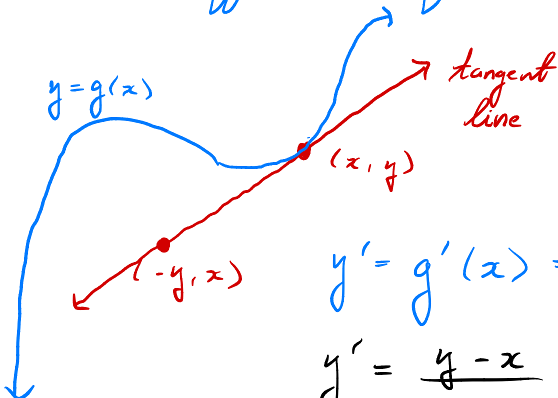
MA 262

HW 1 # 6 A function $y = g(x)$ is described by the following

- The tangent line to g at (x,y) passes through the point $(-y, x)$

Find a differential equation that g is a solution to.



Slope of the tan. line

$$m = \frac{\text{rise}}{\text{run}} = \frac{y-x}{x-(-y)} = \frac{y-x}{x+y}$$

$$y' = g'(x) = m = \frac{y-x}{x+y}$$

$$y' = \frac{y-x}{x+y}$$

HW 1 # 7 Write a differential equation which satisfies the following model:

- The time R.o.C. in temp. T of coffee is proportional to the difference between the fixed temp. M of air at time t and the temp of coffee at time t.

$$\frac{dT}{dt} = k\,(M - T) = k\,(M - T(t))$$

ODE = "ordinary differential equation"

HW2 #3 | $\frac{dy}{dx} = \frac{10}{x^2+4}$, $y(0)=0$, $y = ??$

$$y = \int dy = \int \frac{10}{x^2+4}\,dx = 10\int \frac{1}{x^2+2^2}\,dx$$

$$\int \frac{1}{x^2+a^2}\,dx = \frac{1}{a}\arctan\left(\frac{x}{a}\right)+C \qquad (\tan^{-1})$$

$$= 10\cdot\frac{1}{2}\arctan\left(\frac{x}{2}\right)+C$$

$$0 = y(0) = 10\cdot\frac{1}{2}\arctan\left(\frac{0}{2}\right)+C$$

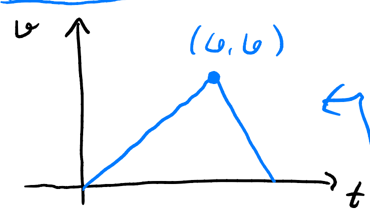
$$0 = 0 + C \qquad \text{so} \qquad C = 0$$

$$y = 5\arctan\left(\frac{x}{2}\right)$$

HW2 #6 |

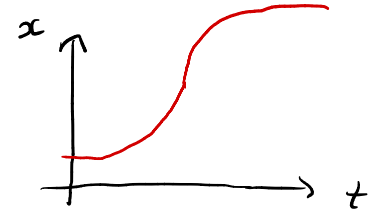
t: time sec

v: velocity meters/sec



particle moving in a straight line w/ given velocity

Find the position graph.



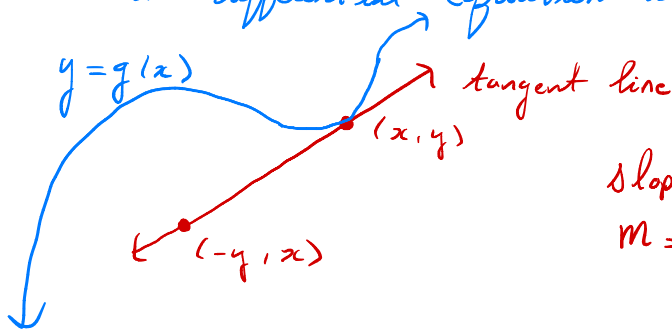
$v = x'$

MA 262

HW 1 #6 A function $y = g(x)$ is described by the following

- The line tangent to g at (x, y) passes through the point $(-y, x)$

Find a differential equation which has solution g.



slope of tangent line

$$m = \frac{\text{rise}}{\text{run}} = \frac{y - x}{x - (-y)} = \frac{y - x}{x + y}$$

$$y' = g'(x) = m = \frac{y - x}{x + y}$$

$y' = \frac{y-x}{x+y}$ is a diff. eq. w/ sol. g.

HW 1 #7 Write a diff. eq. which satisfies the following model:

- The time R.o.C. in the temp. T of coffee is proportional to the difference between the fixed temp. M of air at time t and the temp. of coffee at time t.

$$\frac{dT}{dt} = k(M - T) = k(M - T(t))$$

HW2 #31 $\quad \dfrac{dy}{dx} = \dfrac{10}{x^2+4}$; $\quad y(0) = 0$; $\quad y = ??$

$$y = \int \frac{dy}{dx} = \int \frac{10}{x^2+4}\,dx = 10\int \frac{1}{x^2+4}\,dx$$

$$\int \frac{1}{x^2+a^2}\,dx = \frac{1}{a}\arctan\left(\frac{x}{a}\right) + c$$

$$y = 10\int \frac{1}{x^2+2^2}\,dx = 10 \cdot \frac{1}{2}\arctan\left(\frac{x}{2}\right) + c$$

$$0 = y(0) = 10 \cdot \frac{1}{2}\arctan\left(\overset{0}{\frac{0}{2}}\right) + c$$

$$0 = 0 + C \qquad \text{So} \qquad C = 0$$

$$y = 5\arctan\left(\frac{x}{2}\right)$$