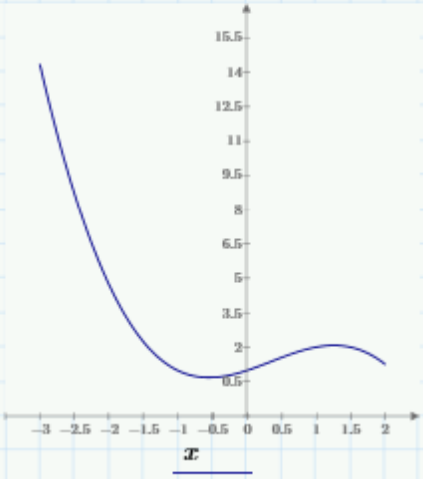
(1)

$a := -3$

$b := 2$

$x := a, a + 0.01 .. b$

$f(x) := \sin(x) - \frac{1}{3} \cdot x^3 + \frac{1}{2} \cdot x^2 + 1$



$f(x)$

$Df(x) := \frac{d}{dx} f(x)$

$D2f(x) := \frac{d^2}{dx^2} f(x)$

Guess Values

$x := 2$

straints

Given

$Df(x) = 0$

SolveCon

$x1 := \mathbf{Find}(x)$

$x1 = 1.251$

$D2f(x1) = -2.452$

$f(x1) = 2.079$

Guess Values

$x := -0.5$

SolveConstraints

Given

$Df(x) = 0$

$x2 := \mathbf{Find}(\mathbf{x})$

$x2 = -0.55$

$D2f(x2) = 2.623$

$f(x2) = 0.684$

Answer: The stationary points are (1.251, 2.079) (local maximum) and (-0.55, 0.684)(local minimum)

(2)

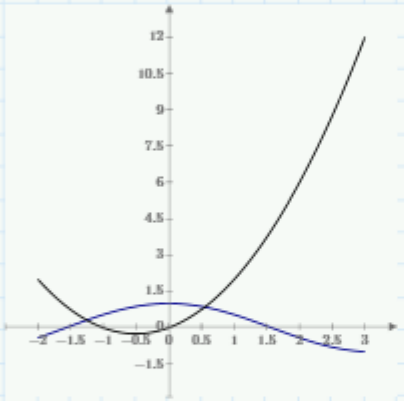
$a := -2$

$b := 3$

$x := a, a + 0.01 .. b$

$f(x) := \cos(x)$

$g(x) := x^2 + x$



$f(x)$

$g(x)$

x

Guess Values

$x := -1.25$

Constraints

Given

$f(x) = g(x)$

$x1 := \text{Find}(x)$

$x1 = -1.251$

Guess Values

$x := 0.5$

Given

$f(x) = g(x)$

$x2 := \text{Find}(x)$

$x2 = 0.55$

$$Area := \int_{x1}^{x2} (f(x) - g(x))\,dx$$

$Area = 1.395$

$$xP := \frac{1}{Area} \cdot \int_{x1}^{x2} \left(\int_{f(x)}^{g(x)} x\,dy \right) dx$$

$$yP := \frac{1}{Area} \cdot \int_{x1}^{x2} \left(\int_{f(x)}^{g(x)} y\,dy \right) dx$$

$xP = 0.344$

$yP = -0.402$ Answer: The center of a gravity plate lies at the point (0.344, -0.402)