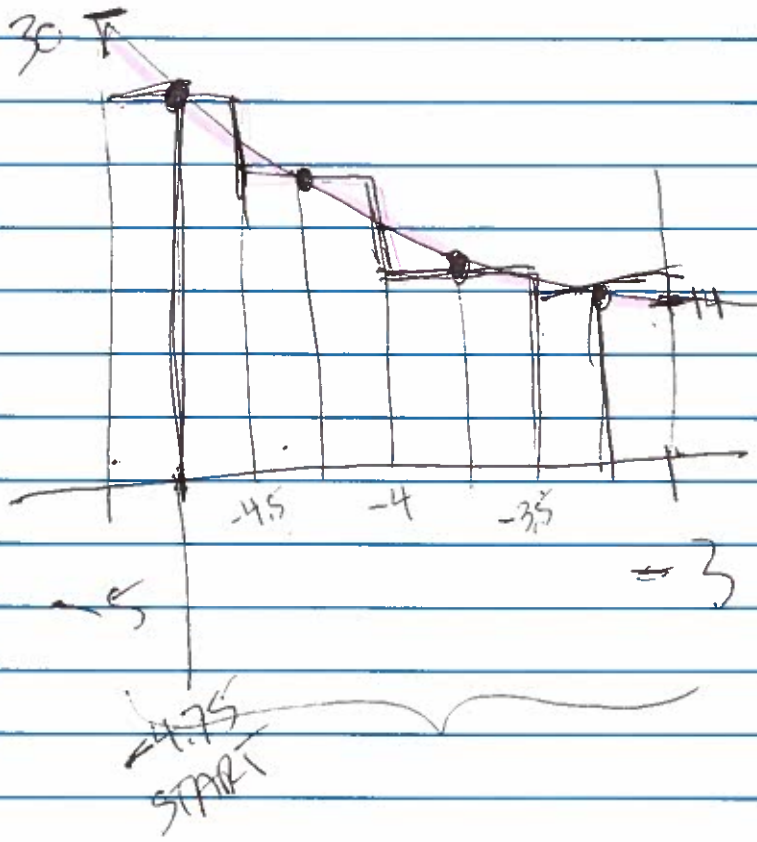


$y = x^2 + 5$

$n = 4$

$= 3$

$$\Delta x = \frac{-3 - -5}{4} = \frac{2}{4-6.5}$$

$$\frac{-5 + -4.5}{2}$$

$$[-4.75] \quad [-4.25] \quad [-3.75] \quad [-3.25]$$

$+.5$ $+.5$ $\times .5$

$$\text{Area} = \text{Sum}(\text{seq}(X^2 + 5, X, -4.75, -3.25, .5)) * .5$$

$$(-5.25 + .5)^2 + 5 = 42.625$$

4 11

Left

$$\int_1^x t^2 - 7t + 9 \, dt$$

$$\frac{t^3}{3} - \frac{7t^2}{2} + 9t \Big|_1^x$$

$$f(x) = \left(\frac{x^3}{3} - \frac{7}{2}x^2 + 9x\right) - \left(\frac{1}{3} - \frac{7}{2} + 9\right)$$

$$f'(x) = x^2 - 7x + 9 + \emptyset$$

$a(t) = 6 - t \quad V(0) = 8 \quad S(0) = 12$

$$V(t) = \int a(t)\,dt = \int 6 - t \, dt = 6t - \frac{t^2}{2} + C$$

$V(0) = \quad = 0 - 0 + C = 8$

$$V(t) = 6t - \frac{t^2}{2} + 8$$

$$S(t) = \int V(t)\,dt = \int 6t - \frac{t^2}{2} + 8 \, dt$$

$$= 3t^2 - \frac{t^3}{6} + 8t + C$$

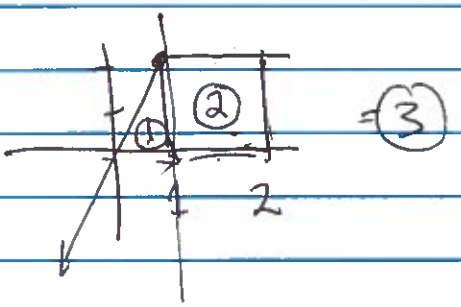
$S(0) \quad = 0 - \frac{0}{6} + 0 + C = 12$

#1 $\int_0^2 f(x)\,dx$

$f(x) = 2x \quad x < 1$

$f(x) = 2 \quad x > 1$

$\int_0^1 2x\,dx + \int_1^2 2\,dx$



$= ③$

$x^2\Big|_0^1 + 2x\Big|_1^2$

$(1+0) + (4-2) = ③$

fint(2x, x, 0, 1) + fint(2, x, 1, 2)

#2 $\int_{-A}^{A} x e^{-8x^2}\,dx = \int_{-8A^2}^{-8A^2} e^u \frac{du}{-16} = 0$

$u = -8x^2$

$du = -16x\,dx$

$\int_B^B f(x)\,dx \equiv 0$

#3 $\int_0^6 4x^2\,dx = \frac{4x^3}{3}\Big|_0^6 = \frac{4 \cdot 6^3}{3}$

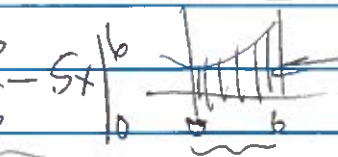
#4 $\int_0^6 x^2 - 5\,dx$ ← area

$= \frac{42}{6} = 7$

$6 - 0$

$\frac{x^3}{3} - 5x\Big|_0^6$

$\frac{6^3}{3} - 5 \cdot 6 = 42$



length

Optimization

$y = Ax^3 + 7$

Constraint

$A + x = 10$

Main Idea

$y(A, x) = Ax^3 + 7$

$A = 10 - x$

$y(x) = (10 - x)x^3 + 7$

$y = 10x^3 - x^4 + 7$

Critical Points

$y' = 30x^2 - 4x^3 = 0$

$x^2(30 - 4x) = 0$

$x = 0 \quad x = 7.5$

Max or Min?

$y'' = 60x - 12x^2$

$y''(0) = 0$ Inconclusive Inflection Point

$y''(7.5) = 60(7.5) - 12(7.5)^2 = -225$

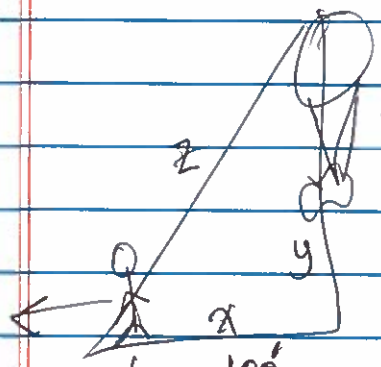
Concave Down

Max

Graph in Calculator

$y = 10x^3 - x^4 + 7$

Rising Balloon



← rising 10'/sec

6'/sec

After 2sec. How fast is the distance between you changing?

WANT $\frac{dz}{dt}$

Have Variables Rates

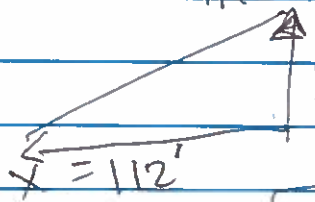
$x = 112'$ $dx/dt = 6'/sec$

$y = 20'$ $dy/dt = 10'/sec$

$z = 113.77$

~~$t = 2sec$~~

~~After~~ 2sec



$\sqrt{112^2 + 20^2}$

113.77

$\frac{dz}{dt}$

$x^2 + y^2 = z^2$

$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2z\frac{dz}{dt}$

$2(112)(6) + 2(20)(10) = 2(113.77)\frac{dz}{dt}$

Selling Ballon

Revenue is $S * P$

Sales is found to be

$S = \frac{1}{2}(50 - P)$

If the price is \$10 and rising by .02 a day How fast the revenue changing?

$R = S \cdot P$

$= \frac{1}{2}(50 - P)P$

$R = 25P - \frac{1}{2}P^2$

$\frac{dR}{dt} = 25\frac{dP}{dt} - P \cdot \frac{dP}{dt}$

$P = \$10$

$\frac{dP}{dt} = \$.02/day$

$\frac{dR}{dt} = 25(.02) - 10(.02)$

$.5 - .2 = .3\$/day$

$$\frac{d}{dx}\cos x = -\sin x$$

$$\int \cos x \, dx$$

$$\sin x + C$$

$$\int \sin x \, dx$$

$$-\cos x + C$$