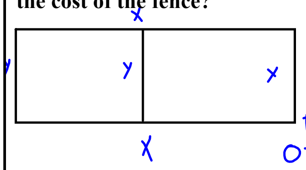
WARM UP

A farmer wants to fence an area of 750 000 m² in a rectangular field and divide it in half with a fence parallel to one of the sides of the rectangle. How can this be done so as to minimize the cost of the fence?



$A = xy$

$750\ldots = xy$

$y = \frac{750000}{x}$

$P = 2x + 3y$

$P = 2x + 3\left(\frac{750000}{x}\right)$

$P = 2x + 2\,250\,000x^{-1}$

$0 = 2 - 2250000x^{-2}$

$0 = 2 - \frac{2250000}{x^2}$

$\frac{2250000}{x^2} = 2$

$2x^2 = 2\,250\,000$

$x^2 = 1\,125\,000$

$x = 1060.7$ m

$A = l \times w$

$750000 = 1060.7w$

$w = \frac{750000}{1060.7}$

$w = 707$ m

Apr 28-7:29 PM

Calculus 120
Unit 4: Applications of Differentiation

May 16, 2019: Day #13

1. Assignment Due
2. Quiz
3. Related Rates
4. Test coming late next week

Jan 9-1:43 PM

Curriculum Outcomes

C8: Use Calculus techniques to sketch the graph of a function.

C9: Use Calculus techniques to solve optimization problems

C11: Use Calculus techniques to solve problems involving related rates.

Jan 24-9:32 AM

Related Rate Problems

In most real life relationships between variables, time will affect the relationship. For example, as a balloon is filled with air, the radius will change as the volume changes. However, the radius and volume are both related to the amount of time that air has been blowing into the balloon.

Any equation involving two or more variables, that are all implied functions of time can be used to find an equation that relates their corresponding rates by taking the derivative with respect to time.

May 7-7:54 PM

$x^2y + 2xy = 7$

May 16-10:46 AM

The Basic Procedure

If $xy^2 = 12$ **and** $\frac{dy}{dt} = 6$, **find** $\frac{dx}{dt}$ **when** $y = 2$ **-18**

$(x)(y^2) = 12$

$x \cdot 2y\frac{dy}{dt} + y^2(1)\frac{dx}{dt} = 0$

$x \cdot 2(2)(6) + 2^2\frac{dx}{dt} = 0$

$24x + 4\frac{dx}{dt} = 0$

$24(3) + 4\frac{dx}{dt} = 0$

$72 + 4\frac{dx}{dt} = 0$

$4\frac{dx}{dt} = -72$

$\boxed{\frac{dx}{dt} = -18}$

$xy^2 = 12$

$x(2)^2 = 12$

$4x = 12$

$x = 3$

May 7-7:59 PM

A spherical snowball is melting in such a way that its volume is decreasing at a rate of 1 cm^3/min. At what rate is the radius decreasing when the radius is 5 cm?

$V = \frac{4}{3}\pi r^3$

$\frac{dV}{dt} = -1\ cm^3/min$

Ans = -1/100pi

(1.) $\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$

$r = 5$

$\frac{dr}{dt} = ?$

$-1 = 4\pi(5)^2 \frac{dr}{dt}$

$-1 = 4\pi(25) \frac{dr}{dt}$

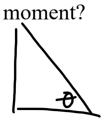
$-1 = 100\pi \frac{dr}{dt}$

$\boxed{\frac{dr}{dt} = -\frac{1}{100\pi}\ cm/min}$

May 7-8:06 PM

A hot air balloon rising straight up from a level field is tracked by a range finder 500 feet from the lift off point. At the moment the range finder's elevation angle is $\frac{\pi}{4}$, the angle is increasing at a rate of 0.14 radians per minute. How fast is the balloon rising at that moment?

Ans = 140

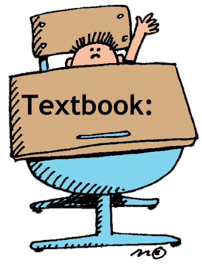


May 7-8:09 PM

A police cruiser, approaching a right-angled intersection from the north, is chasing a speeding car that has turned the corner and is now moving straight east. When the cruiser is 0.6 mi north of the intersection and the car is 0.8 mi to the east, the police determine with radar that the distance between them and the car is increasing at 20 mph. If the cruiser is moving at 60 mph at the instant of measurement, what is the speed of the car?

ans = 70

May 8-8:51 AM



Assignment!

Jan 13-9:38 PM

Attachments

- 2.1_74_AP.html
- 2.1_74_AP.swf
- 2.1_74_AP.html