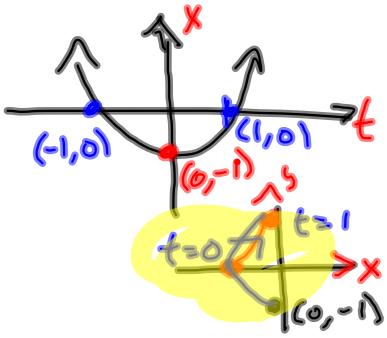
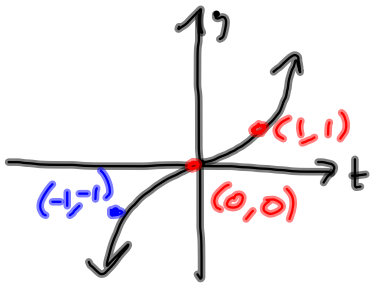
11.1 #525, 26

$x = f(t)$

$y = g(t)$




A thingie on how these parametric functions are graphed. Several examples:

http://www.stewartcalculus.com/tec/

| t | x | y |
|---|---|---|
| 0 | -1 | 0 |
| 1 | 0 | 1 |
| -1 | 0 | -1 |

$\frac{dx}{dt} < 0$ on $(-\infty, 0)$

$\frac{dx}{dt} > 0$ on $(0, \infty)$

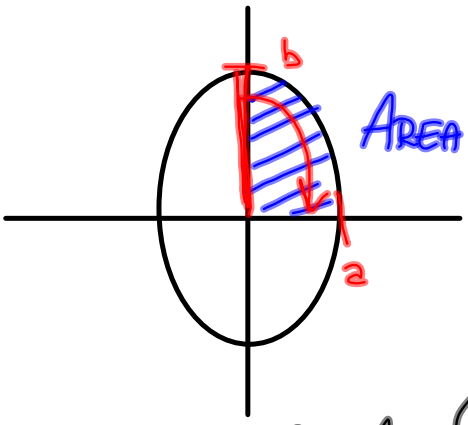
$t > 0$

$\frac{dy}{dt} > 0$

$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$ $\frac{+}{+}$ $-$

$\frac{d^2y}{dx^2} = \frac{\frac{d}{dt}\left[\frac{dy}{dx}\right]}{\frac{dx}{dt}}$ $+$

§11.2 #31 Use $x = a\cos\theta$, $y = b\sin\theta$ $0 \le \theta \le 2\pi$ to find the area of the ellipse




AREA = 4 · Shaded area

$$4\int_0^a$$

In general $A = \int_c^d y\,dx = \int_{\frac{\pi}{2}}^{0} b\sin\theta(-2\sin\theta\,d\theta)$

$x = a\cos\theta$

$\frac{x}{a} = \cos\theta$

$$= -4ab\int_{\frac{\pi}{2}}^{0}\sin^2\theta\,d\theta = 4ab\int_0^{\frac{\pi}{2}}\sin^2\theta\,d\theta$$

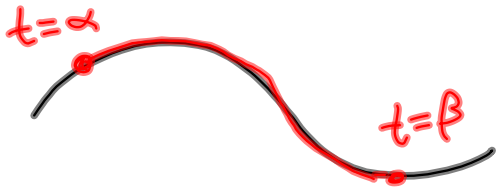
$$= 4ab\int_0^{\frac{\pi}{2}}\left(\frac{1-\cos(2\theta)}{2}\right)d\theta = 2ab\int_0^{\frac{\pi}{2}}(1-\cos(2\theta))\,d\theta$$

$$2ab\left[\theta - \frac{1}{2}\sin(2\theta)\right]_0^{\frac{\pi}{2}} = 2ab\left[\frac{\pi}{2} - 0 - [0-0]\right]$$

$$= \frac{2\pi ab}{2} = \pi ab$$

$x = x(t)$

$y = y(t)$




$$L = \int_{\alpha}^{\beta} \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\, dt$$

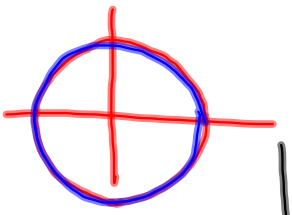
Consider: $x = \cos(2t)$ $y = \sin(2t)$

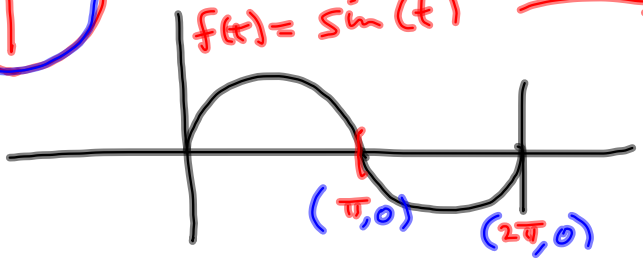
describes a circle. RECOGNIZE PERIOD IS $\pi$.

$$L = \int_0^{2\pi} \sqrt{(2\sin(2t))^2 + (-2\cos(2t))^2}\, dt = \int_0^{\pi} + \int_{\pi}^{2\pi}$$

$$= 2\int_0^{2\pi} \sqrt{\sin^2(2t) + \cos^2(2t)}\, dt$$

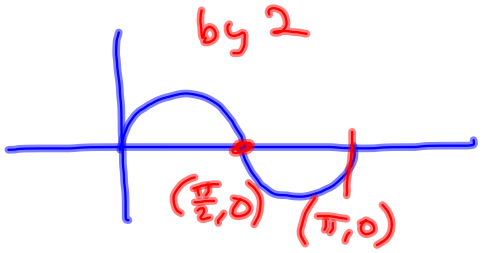
$$= 2\int_0^{2\pi} dt = 2t\Big]_0^{2\pi} = 4\pi = \text{circumference of the circle!?}$$






$\Rightarrow \sin(2t)$ Divide t-values by 2

f(2t)



Test 3 over Chapters 9, 10 by next Friday.

Mixture of Chapters 9, 10, 11 in lecture.

Mastery Reform on Test 2: I'll give you up to 40% of the points you missed.
- Re-submit the old test that I graded.
- Work EVERY problem that you dropped any points on perfectly.
- Due a week from Friday, October 35th.

11.1, 11.2 I on Monday
11.2 II on Tuesday.