**Find the exact length of the curve analytically by antidifferentiation.** or $\frac{dx}{dy}$)

$$L = \int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\,dx \leftarrow \text{(or } dy\text{)}$$

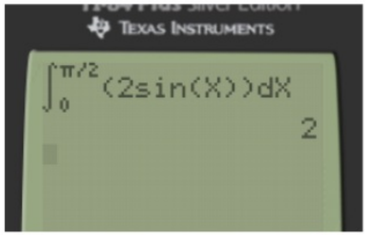
20) $y = \int_0^x \sqrt{4\sin^2 t - 1}\,dt,\ 0 \le x \le \frac{\pi}{2}$ 20) ____________

so...

$$\frac{dx}{dy} = \sqrt{4\sin^2 x - 1}$$

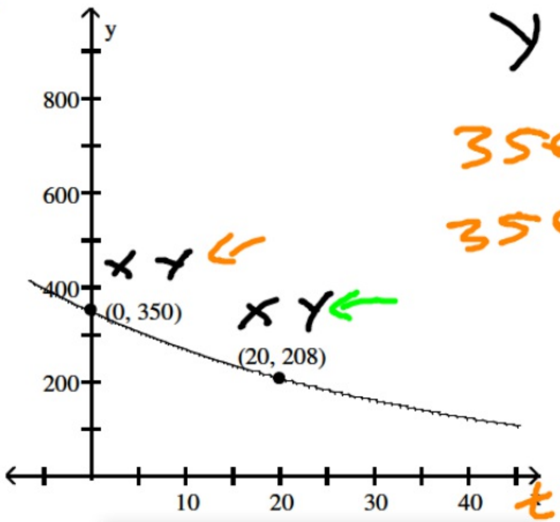
$$L = \int_0^{\frac{\pi}{2}} \sqrt{1 + 4\sin^2 x - 1}\,dx$$

$$= \int_0^{\frac{\pi}{2}} \left(\sqrt{4\sin^2 x}\right)dx = \int_0^{\frac{\pi}{2}} 2\sin x\,dx$$



Find the exponential function $y = y_0e^{kt}$ whose graph passes through the two given points.

21)




$y = y_0 e^{kt}$

$350 = y_0 e^{(0)(k)}$

$350 = y_0$

$208 = 350e^{20k}$

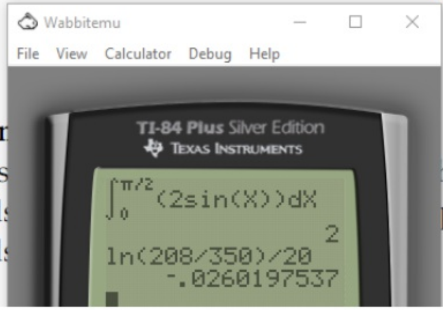
$\frac{208}{350} = e^{20k}$

$\ln\left(\frac{208}{350}\right) = \ln e^{20k}$

$\ln\left(\frac{208}{350}\right) = 20k$

$k = -.026$

21) $\boxed{y = 350e^{-.26t}}$




**Solve the probler**

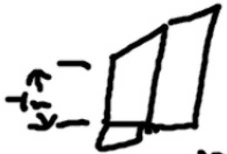
22) Suppos... hows the velocity of a car every second for 8 seconds... pproximate the distance traveled by the car in the 8 seconds

22) ____________

**Solve the problem.**

22) Suppose that the accompanying table shows the velocity of a car every second for 8 seconds. Use the Trapezoidal Rule to approximate the distance traveled by the car in the 8 seconds. 22) ____________

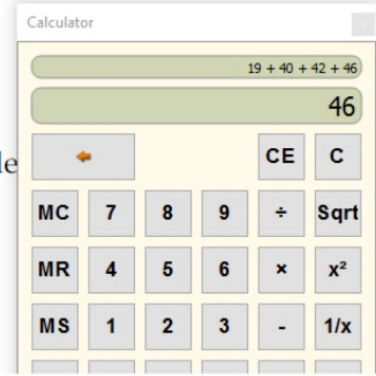
| Time (sec) | Velocity (ft/sec) | |
|---|---|---|
| 0 | 19 | $y_0$ |
| 1 | 20 | $y_1$ |
| 2 | 21 | $y_2$ |
| 3 | 23 | $y_3$ |
| 4 | 22 | $y_4$ |
| 5 | 24 | $y_5$ |
| 6 | 21 | $y_6$ |
| 7 | 19 | $y_7$ |
| 8 | 20 | $y_8$ |



$\Delta x \to dx$

$$\frac{h}{2}\left(y_0 + 2y_1 + 2y_2 + 2y_3 + \dots\right.$$

$$h=1 \quad A = \frac{1}{2}\left(19 + 2(20) + 2(21) + 2(23) + 2(22) + 2(24) + 2(21) + 2(19) + 20\right.$$




23) A particle moves with velocity $v(t) = 2t + 3$ find the distance travele
2. 23) ____________

**Evaluate the integral.**

24) $\int (\sqrt{t} - \sqrt[6]{t})\,dt$ 24)

23) A particle moves with velocity $v(t) = 2t + 3$ find the distance traveled between $t = 0$ and $t = 2$. 23) ______________

23

$s(t) = \int v(t)\, dt$

21

$= \int_0^2 (2t+3)\, dt$

**Evaluate the integral.**

24) $\int (\sqrt{t} - \sqrt[6]{t})\, dt$ 24) ______________

24

$\int (t^{\frac{1}{2}} - t^{\frac{1}{6}})\, dt$

$y = \frac{2}{3} t^{\frac{3}{2}} - \frac{6}{7} t^{\frac{7}{6}} + C$

**Verify that $\int f(u)\, du \neq \int f(u)\, dx$.**

25) $f(u) = \sqrt{u}$ and $u = x^4$ $(x > 0)$. 25) ______________

**Evaluate the integral.**

24) $\int (\sqrt{t} - \sqrt[6]{t})\,dt$ 24) ______

$(x^4)^{\frac{3}{2}} = x^6$

**Verify that** $\int f(u)\,du \neq \int f(u)\,dx$.

25) $f(u) = \sqrt{u}$ and $u = x^4$ $(x > 0)$. 25) ______

$\int \sqrt{u}\,du = \int u^{\frac{1}{2}}\,du = \frac{2}{3}u^{\frac{3}{2}} + C = \boxed{\frac{2}{3}x^6 + C}$

$\neq$

$\int \sqrt{u}\,dx = \int \sqrt{x^4}\,dx = \int x^2\,dx = \boxed{\frac{1}{3}x^3 + C}$