Sheet #630 NAME: KEY

SOLVING DIFFERENTIAL EQUATIONS Period

1. FIND GENERAL SOLUTION.

a, $dy/dx = 1/x^2$ $\quad y = \frac{-1}{x} + C$

b, $dy/dx = 1/x$ $\quad y = \ln|x| + C$

2. FIND PARTICULAR SOLUTION TO THE INITIAL VALUE PROBLEM

$$\frac{dy}{dx} = \sin(x), \quad y(\pi) = \frac{1}{2}$$

$y = \int \sin(x)\,dx = -\cos(x) + C$

a, $\frac{1}{2} = -\cos(\pi) + C$ → b, $\boxed{y = -\cos(x) - \frac{1}{2}}$

USING FTC:

$y(x) = y(\pi) + \int_\pi^x \sin(t)\,dt$

$\boxed{y(x) = \frac{1}{2} + \int_\pi^x \sin(t)\,dt}$

$y(x) = \frac{1}{2} - (\cos x - \cos\pi)$

$y(x) = \frac{1}{2} - \cos(x) - 1$

3. SOLVE FOR y, FIND y VALUE, GRAPH.

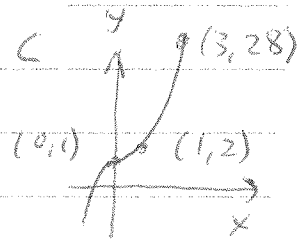
$\begin{cases} dy/dx = 3x^2 \quad y(1) = 2 \\ \text{FIND } y(3). \text{ GRAPH} \end{cases}$

$y = \int 3x^2\,dx = x^3 + C$

$2 = 1^3 + C$

$\boxed{y = x^3 + 1}$

$y(3) = 3^3 + 1 = \boxed{28}$



USING FTC:

$\boxed{y(x) = y(1) + \int_1^x 3t^2\,dt}$

$y(3) = y(1) + \int_1^3 3t^2\,dt$

$= 2 + t^3\Big]_1^3 = 2 + 3^3 - 1 =$

$= \boxed{28}$

4. SAME INSTRUCTIONS AS ABOVE.

$\begin{cases} dy/dx = \cos(e^x), \quad y(0) = 1 \\ \text{FIND } y(2). \text{ GRAPH.} \end{cases}$

ANTIDERIVATIVE FORMULA FOR $\cos(e^x)$? ☹

WRONG ANSWERS: $\sin(e^x)$, $\sin(e^x)/e^x$

USING FTC:

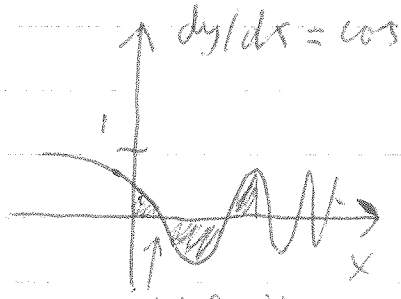
$y(x) = y(0) + \int_0^x \cos(e^t)\,dt$

$\boxed{y(x) = 1 + \int_0^x \cos(e^t)\,dt}$

ANSWER. ☺

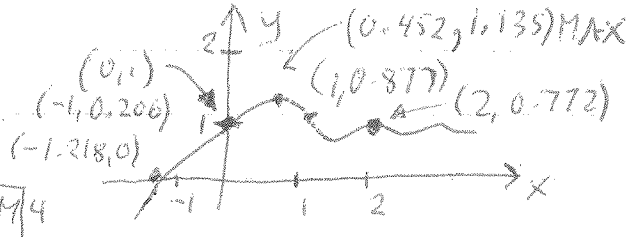
$y(2) = 1 + \int_0^2 \cos(e^t)\,dt$

$\approx 1 - 0.2277 \approx \boxed{0.772}$



MAX for y

$x = 0.452$



ZOOM 4

WINDOW Xres = 3

TOLERANCE BIGGER ↓

Y= 1 + fnInt(cos(e^x), x, 0, X, 0.01)