Find each integral. (Formula sheet?!?)

$\int 2x^5 dx$

$2\int x^5 dx$

$2\left(\frac{1}{6}x^6\right)+C$

$\boxed{\frac{1}{3}x^6+C}$

$\int 3\sin 2x\,dx$

$3\left(-\frac{1}{2}\cos 2x\right)+C$

$\boxed{-\frac{3}{2}\cos 2x+C}$

$\int 7e^{-4t} dt$

$\boxed{-\frac{7}{4}e^{-4t}+C}$

$\int \frac{2}{x^3} dx$

$2\int x^{-3} dx$

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

$2x^{-2}$

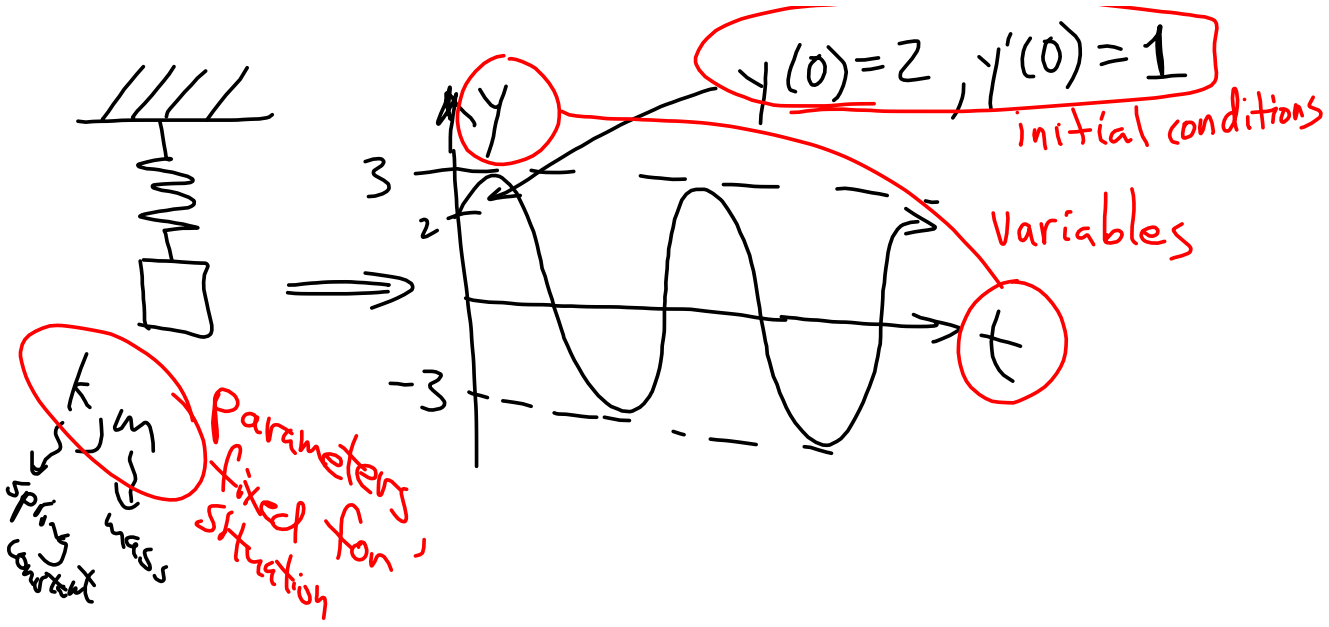
$-x^{-2}+C$

$\boxed{-\frac{1}{x^2}+C}$

$2y'' + 5y' + 2y = 7\sin 3t$ 2nd-order linear

$2y'' + 5y' + 2y = 0$ 2nd order, linear homogeneous

only applies to linear


y(0)=2, y'(0)=1
initial conditions
Variables
y
t
3
2
-3
k, m
parameters fixed for situation
spring constant
mass

Solve $\frac{dy}{dx} - \frac{x^2}{y} = 0$, $y(0) = 1$

$\frac{dy}{dx} = \frac{x^2}{y}$

$\frac{dy}{dx} = x^2 \cdot \frac{1}{y}$

$dy = \frac{x^2}{y} dx$

$y\,dy = x^2 dx$

$\int y^1 dy = \int x^2 dx$

$\frac{1}{2}y^2 + C_1 = \frac{1}{3}x^3 + C_2$

Sol to ODE $\rightarrow$ $\frac{1}{2}y^2 = \frac{1}{3}x^3 + C_3$ $(C_3 = C_2 - C_1)$

Remember, $y(0) = 1$

when $x = 0$, $y = 1$

$\frac{1}{2}(1)^2 = \frac{1}{3}(0)^3 + C_3$

$\frac{1}{2} = C_3$

$$\frac{1}{2}y^2 = \frac{1}{3}x^3 + \frac{1}{2}$$