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Missed Test: Weight shifts to exam

REVIEW

$f(x)$	$f'(x)$
e^{2x}	$2e^{2x}$
$\ln x$	$\frac{1}{x}$
$\sin 2x$	$2 \cos 2x$
$\cos 3x$	$-3 \sin 3x$
$\tan 4x$	$4 \sec^2 4x$
$\sec x$	$\sec x \tan x$
$\csc x$	$-\csc x \cot x$
$\cot x$	$-\csc^2 x$
$\sin^{-1} x$	$\frac{1}{\sqrt{1-x^2}}$
$\tan^{-1} x$	$\frac{1}{1+x^2}$
$\frac{2}{x^7} = 2x^{-7}$	$-14x^{-8}$
$\sqrt[3]{x} = x^{1/3}$	$\frac{1}{3} x^{-2/3}$

$$\int \sec^2 x dx = \tan x + C$$

$$\frac{d}{dx} [\tan x] = \sec^2 x$$

$$\int \csc x \cot x dx = -\csc x + C$$

$$\int \csc^2 x dx = -\cot x + C$$

$f(x)$	$\int f(x) dx$
e^{7x}	$\frac{e^{7x}}{7} + C$
$\frac{1}{x}$	$\ln x + C$

$f(x)$	$\int f(x) dx$
$\sin 2x$	$-\frac{\cos 2x}{2} + C$
$\cos 3x$	$\frac{\sin 3x}{3} + C$
$\frac{2}{x^7} = 2x^{-7}$	$-\frac{1}{3} x^{-6} + C$
$\sqrt[3]{x} = x^{1/3}$	$\frac{3}{4} x^{4/3} + C$
$\frac{1}{\sqrt{4-x^2}}$	$\sin^{-1} \frac{x}{2} + C$
$\frac{1}{4+x^2}$	$\frac{1}{2} \tan^{-1} \frac{x}{2} + C$
$\cot x$	$\ln \sin x + C$ or $-\ln \csc x + C$

} use formula sheet

1.1 Introduction

Differential equation (DE) :
Equation involving derivatives

Ex: a) $\frac{dy}{dx} = 25 + y^2$

b) $x^2 y'' - 2xy' + by = 0$

Ex: Confirm that $y = \sin 5x$ is a solution to

$\frac{dy}{dx} = 25 + y^2$ DE

$$\text{Solution } \begin{cases} y = 5 \tan 5x \\ \frac{dy}{dx} = 25 \sec^2 5x \end{cases}$$

$$\begin{aligned} \text{LS of DE} &= \frac{dy}{dx} \\ &= 25 \sec^2 5x \end{aligned}$$

$$\begin{aligned} \text{RS of DE} &= 25 + y^2 \\ &= 25 + (5 \tan 5x)^2 \\ &= 25 + 25 \tan^2 5x \\ &= 25 (1 + \tan^2 5x) \\ &= 25 \sec^2 5x \end{aligned}$$

$$\text{LS} = \text{RS} \quad \checkmark$$

Ex: Let P : population t : time

$$\text{Confirm that } P = \frac{6}{5} (1 - e^{-20t})$$

$$\text{Solves } \frac{dP}{dt} + 20P = 24$$

$$\text{Solution } \begin{cases} P = \frac{6}{5} (1 - e^{-20t}) \\ \frac{dP}{dt} = \frac{6}{5} (20e^{-20t}) \\ = 24e^{-20t} \end{cases}$$

$$\begin{aligned} \text{LS of DE} &= \frac{dP}{dt} + 20P \\ &= 24e^{-20t} + 20 \cdot \frac{6}{5} (1 - e^{-20t}) \\ &= 24e^{-20t} + 24(1 - e^{-20t}) \\ &= 24e^{-20t} + 24 - 24e^{-20t} \\ &= 24 \\ &= \text{RS of DE} \quad \checkmark \end{aligned}$$