WARM UP - Start new page

1. If $a<0$, the graph of $y = ax^3 + 3x^2 + 4x+5$ is concave up on which of the following intervals?

(D) $\left(\frac{1}{a}, \infty\right)$ (E) $(-\infty, -1)$

(A) $\left(-\infty, -\frac{1}{a}\right)$ (B) $\left(-\infty, \frac{1}{a}\right)$ (C) $\left(-\frac{1}{a}, \infty\right)$

2. Find dy/dx: $\ln(xy) + 5x = 30$.

Notebook - Clean Out

Keep:

- All notes from 1st quarter.
- Round the clock partners.
- Today's warm up
- Optimization WS (half sheet/with work)

Take out:

- Quizzes
- Homework
- Warm ups
- Classwork

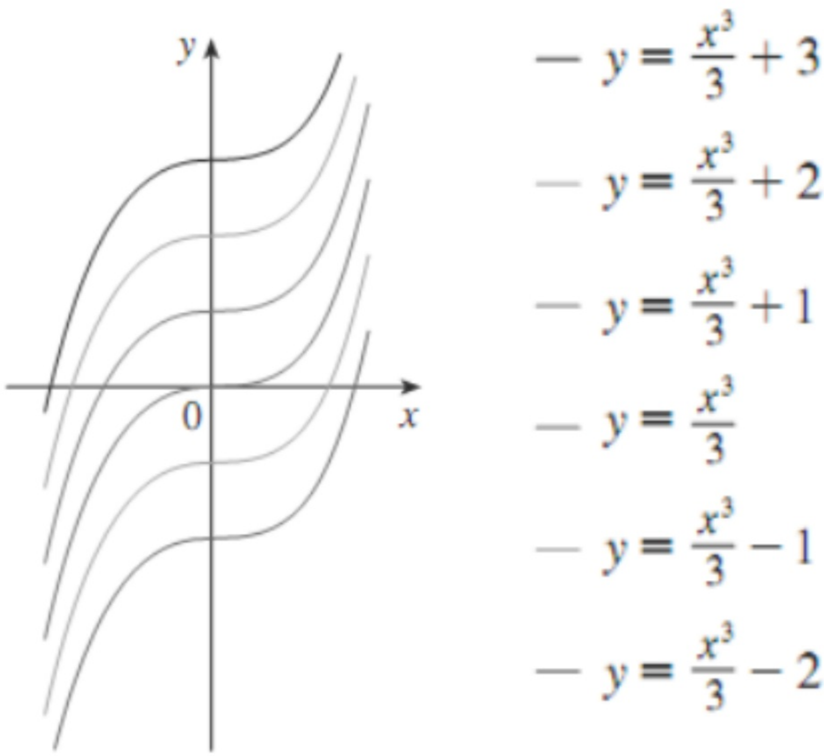
ANTIDERIVATIVES AND INDEFINITE INTEGRATION

Objective:

- Find an antiderivative of a function.
- Find the indefinite integral of a function.

Ex.1: Suppose we have a functions whose derivative is $F'(x) = x^2$. What are some of the possible values for $F(x)$ - the original function?

F is called an antiderivative. For the general antiderivative you must include a plus C (constant), to represent the "family" of graphs that the function could be.



Ex. 2: Using your knowledge of derivatives, find the general antiderivatives of the following.

A. f '(x) = 2x

B. f '(x) = x

C. $F'(x) = \frac{2}{3}x^{\frac{4}{7}}$

D. $\frac{dy}{dx} = \cos x$

The process of finding the antiderivatives is called indefinite integration. We can denote this operation with an integral symbol:

$$\int$$

$$\int f(x)dx = \text{Antiderivative} + \text{C}$$

Integration is the "inverse" of differentiation.

if $\int f(x)\, dx = F(x) + C$, then

$$\frac{d}{dx}\left[\int f(x)\, dx\right] = f(x).$$

Basic Integration Rules

Differentiation Formula	**Integration Formula**
$\frac{d}{dx}[C] = 0$	$\int 0\, dx = C$
$\frac{d}{dx}[kx] = k$	$\int k\, dx = kx + C$
$\frac{d}{dx}[kf(x)] = kf'(x)$	$\int kf(x)\, dx = k\int f(x)\, dx$
$\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$	$\int [f(x) \pm g(x)]\, dx = \int f(x)\, dx \pm \int g(x)\, dx$
$\frac{d}{dx}[x^n] = nx^{n-1}$	$\int x^n\, dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$ Power Rule

Ex. 3:

A. $\int 7\,dx$

B. $\int \left(t^3 + t + 1\right)\,dt$

C. $\int \left(2\sqrt[3]{y} - 4\sqrt[4]{y}\right)\,dy$

Ex. 4: Sometimes it's useful to simplify before you integrate.

A. $\int \frac{x^2 + 3x + 1}{x^4}\,dx$

B. $\int (2x - 3)^2\,dx$

Basic Trig Integration Rules

$$\frac{d}{dx}[\sin x] = \cos x$$

$$\frac{d}{dx}[\cos x] = -\sin x$$

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

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

$$\frac{d}{dx}[\cot x] = -\csc^2 x$$

$$\frac{d}{dx}[\csc x] = -\csc x \cot x$$

$$\int \cos x\, dx = \sin x + C$$

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

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

$$\int \sec x \tan x\, dx = \sec x + C$$

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

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

Ex. 5:

A. $\int 4\sin x \, dx$

B. $\int \frac{-2\cos x}{3} \, dx$

Ex. 6: Simplify first

A. $\int \frac{5}{\cos^2 x}\, dx$

B. $\int \left(\theta^2 - 2\csc^2\theta\right) d\theta$

sin
◊
cos
◊
Differentiation – sin Integration
◊
– cos
◊
sin

When you differentiate, you follow the chart down.

When you integrate, you follow the chart up.