

A week from today,

EXAM 3

EXAM 3 Review is posted

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$$2^{x+y} = x y^3$$

$$\ln 2 \cdot 2^{(x+y)} \cdot (1+y') = y^3 + x \cdot 3y^2 y'$$

$$\vdots$$

Solve for y'

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Antiderivatives after the
Chain Rule

$$\int (2x+1)^{10} dx = \frac{(2x+1)^{11}}{22} + C$$

a good guess: $\frac{(2x+1)^{11}}{22}$

differentiate: $\frac{d}{dx} \left[\frac{(2x+1)^{11}}{22} \right] = \frac{11(2x+1)^{10}}{22} \cdot 2$

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$$\int \sin(2x) dx = -\frac{\cos 2x}{2} + C$$

First guess: $-\cos 2x$

$$\frac{d}{dx} (-\cos 2x) = \sin 2x \cdot 2$$

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$$\int \sqrt{5x-1} dx = \frac{2}{15} (5x-1)^{3/2} + C$$

First $\int \sqrt{x} dx = \int x^{1/2} dx = \frac{x^{3/2}}{3/2} + C$
 $= \frac{2}{3} x^{3/2} + C$

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$$\int \frac{1}{3x+1} dx = \frac{\ln |3x+1|}{3} + C$$

$$\int \frac{1}{(2x-7)^3} dx = \frac{(2x-7)^{-2}}{-2 \cdot 2} + C$$

to undo multiplier from chain rule \nearrow

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$$\int \frac{1}{1-x} dx = -\ln|1-x| + C$$

$$-\int \frac{1}{x-1} dx = -\ln|x-1| + C$$

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$$\int e^{5x} dx = \frac{e^{5x}}{5} + C$$

$$\int \cos(\pi x) dx = \frac{\sin(\pi x)}{\pi} + C$$

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$$\frac{x-1}{x+2} = \frac{x+2-2-1}{x+2} = \frac{x+2}{x+2} - \frac{3}{x+2}$$

$$= 1 - \frac{3}{x+2}$$

$$\frac{x+4}{x-3} = \frac{x-3+3+4}{x-3} = \frac{x-3}{x-3} + \frac{7}{x-3}$$

$$= 1 + \frac{7}{x-3}$$

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$$\frac{2x-1}{x+3} = \frac{2x+6-6-1}{x+3}$$

$$= \frac{2x+6}{x+3} - \frac{7}{x+3}$$

$$= 2 - \frac{7}{x+3}$$

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

$$= 0 - 3(-1)(x+2)^{-2}$$

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

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$$\frac{d}{dx} \left(\frac{x+4}{x-3} \right) = \frac{d}{dx} \left(1 + \frac{7}{x-3} \right) = \frac{d}{dx} \left(1 + 7(x-3)^{-1} \right)$$

$$= 0 + 7(-1)(x-3)^{-2}$$

$$= \frac{-7}{(x-3)^2}$$

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$$\int \frac{x-1}{x+2} dx = \int \left(1 - \frac{3}{x+2}\right) dx$$

$$= x - 3 \ln|x+2| + C$$

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$$\int \frac{x+5}{x-5} dx = \int 1 + \frac{10}{x-5} dx = x + 10 \ln|x-5| + C$$

$$\frac{x-5+5+5}{x-5} = \frac{x-5}{x-5} + \frac{10}{x-5}$$

$$= 1 + \frac{10}{x-5}$$

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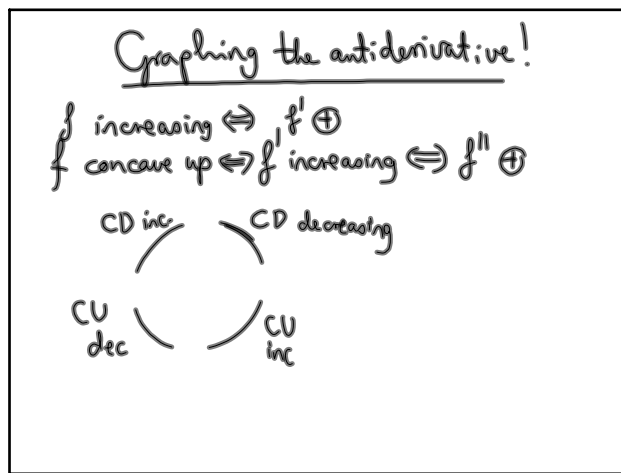
$$\begin{array}{r} x^2+5 \text{ R } 3 \\ x-2 \overline{) x^3 - 2x^2 + 5x - 7} \\ \underline{-x^3 + 2x^2} \\ 5x - 7 \\ \underline{-5x + 10} \\ 3 \end{array}$$

$$\frac{x^3}{x} = x^2$$

$$x^2(x-2) = x^3 - 2x^2$$

$$5(x-2) = 5x - 10$$

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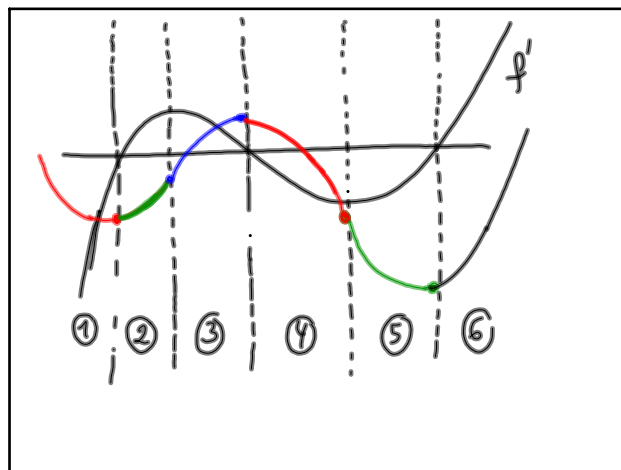
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interval ①:
 f' negative $\Rightarrow f$ decreasing
 increasing \Rightarrow concave up

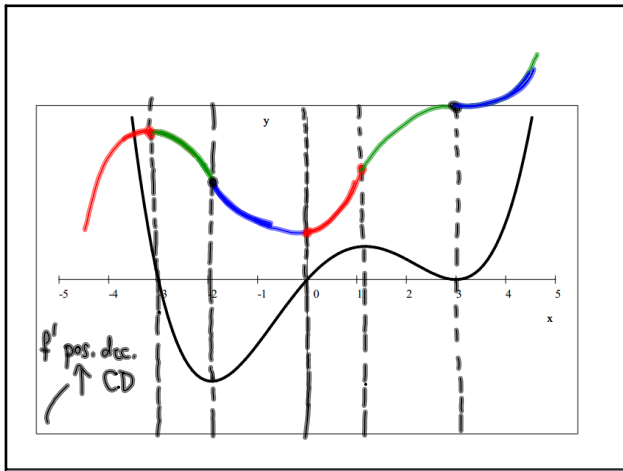
interval ②:
 f' positive $\Rightarrow f$ increasing
 increasing \Rightarrow concave up

interval ③:
 f' positive $\Rightarrow f$ increasing
 decreasing \Rightarrow concave down

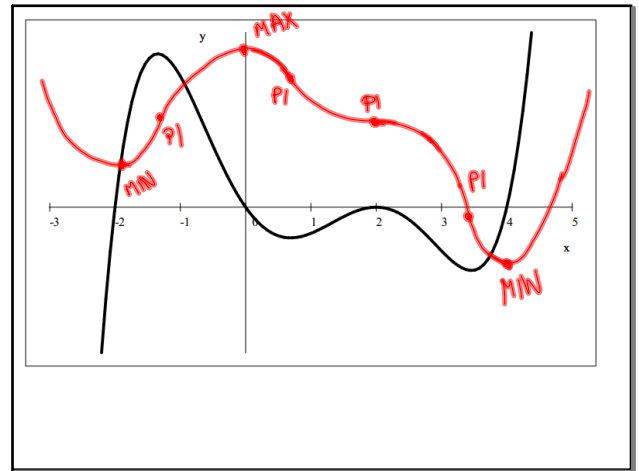
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