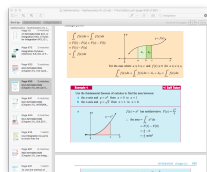
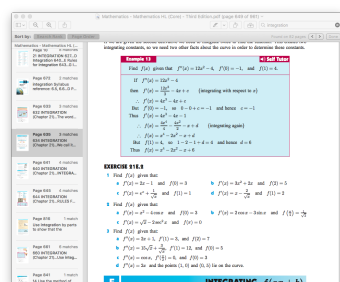
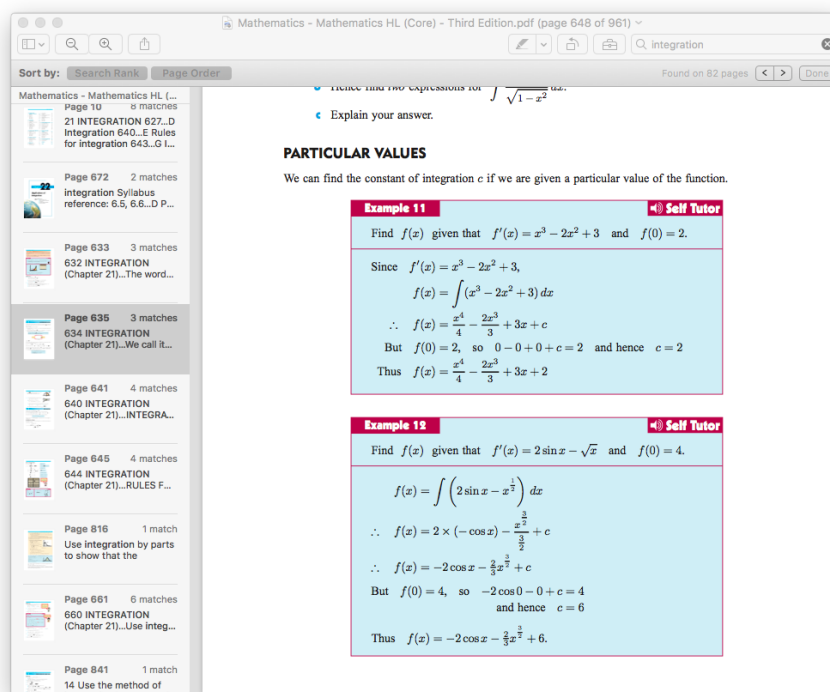


Integraler fortsättning



Hitta primitiva funktionen



Integrera utan gränser

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There is no product or quotient rule for integration. Consequently we often have to carry out multiplication or division before we integrate.

Example 9 **Self Tutor**

Find: a $\int \left(3x + \frac{2}{x}\right)^2 dx$ b $\int \left(\frac{x^2 - 2}{\sqrt{x}}\right) dx$

a $\int \left(3x + \frac{2}{x}\right)^2 dx$
 $= \int \left(9x^2 + 12 + \frac{4}{x^2}\right) dx$
 $= \int (9x^2 + 12 + 4x^{-2}) dx$
 $= \frac{9x^3}{3} + 12x + \frac{4x^{-1}}{-1} + c$
 $= 3x^3 + 12x - \frac{4}{x} + c$

We expand the brackets and simplify to a form that can be integrated.

b $\int \left(\frac{x^2 - 2}{\sqrt{x}}\right) dx$
 $= \int \left(\frac{x^2}{\sqrt{x}} - \frac{2}{\sqrt{x}}\right) dx$
 $= \int \left(x^{\frac{3}{2}} - 2x^{-\frac{1}{2}}\right) dx$
 $= \frac{x^{\frac{5}{2}}}{\frac{5}{2}} - \frac{2x^{\frac{1}{2}}}{\frac{1}{2}} + c$
 $= \frac{2}{5}x^2\sqrt{x} - 4\sqrt{x} + c$

EXERCISE 21E.1

1 Find:

a $\int (x^4 - x^2 - x + 2) dx$ b $\int (\sqrt{x} + e^x) dx$ c $\int \left(3e^x - \frac{1}{x}\right) dx$
d $\int \left(x\sqrt{x} - \frac{2}{x}\right) dx$ e $\int \left(\frac{1}{x\sqrt{x}} + \frac{4}{x}\right) dx$ f $\int \left(\frac{1}{2}x^3 - x^4 + x^{\frac{1}{3}}\right) dx$
g $\int \left(x^2 + \frac{3}{x}\right) dx$ h $\int \left(\frac{1}{2x} + x^2 - e^x\right) dx$ i $\int \left(5e^x + \frac{1}{3}x^3 - \frac{4}{x}\right) dx$

2 Integrate with respect to x :

a $3 \sin x - 2$ b $4x - 2 \cos x$ c $\sin x - 2 \cos x + e^x$
d $x^2\sqrt{x} - 10 \sin x$ e $\frac{x(x-1)}{3} + \cos x$ f $-\sin x + 2\sqrt{x}$

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Example 17 **Self Tutor**

Evaluate: a $\int_0^1 x^2 dx$ b $\int_0^1 (x^2 + \frac{1}{x}) dx$

a $\int_0^1 x^2 dx$
 $= \left[\frac{x^3}{3}\right]_0^1$
 $= \frac{1^3}{3} - \frac{0^3}{3}$
 $= \frac{1}{3}$

b $\int_0^1 (x^2 + \frac{1}{x}) dx$
 $= \left[\frac{x^3}{3} + \ln x\right]_0^1$
 $= \left(\frac{1^3}{3} + \ln 1\right) - \left(\frac{0^3}{3} + \ln 0\right)$
 $= \frac{1}{3} + 0 - (-\infty)$
 $= \frac{1}{3} + \infty$
 $= \infty$

EXERCISE 21E.1

1 Evaluate the following and check with your graphics calculator:

a $\int_0^1 x^2 dx$ b $\int_0^1 (x^2 - 1) dx$ c $\int_0^1 e^x dx$
d $\int_0^1 \left(x - \frac{1}{x}\right) dx$ e $\int_0^1 \frac{1}{\sqrt{x}} dx$ f $\int_0^1 \frac{1}{x^2} dx$
g $\int_0^1 (x^2 + 1)^2 dx$ h $\int_0^1 x^2 \ln x dx$ i $\int_0^1 x^2 \ln^2 x dx$

2 Evaluate:

a $\int_0^1 \sin x dx$ b $\int_0^1 \cos x dx$ c $\int_0^1 \tan^2 x dx$
d $\int_0^1 \sec^2 x dx$ e $\int_0^1 \csc^2 x dx$ f $\int_0^1 \cot^2 x dx$