③ $\int (6x+5)\sqrt{3x^2+5x}\,dx = \int \underbrace{(6x+5)\left(\overset{u}{3x^2+5x}\right)^{1/2}dx}_{du}$

$u = 3x^2+5x$

$du = (6x+5)dx$

$$= \int u^{1/2}\,du$$

$$= \frac{2}{3}u^{3/2} + C$$

$$= \frac{2}{3}\left(3x^2+5x\right)^{3/2} + C$$

⑦ $\int 6 x^2 (2x^3+5)^4 dx$

$u = 2x^3+5$

$du = 6x^2 dx$

$\frac{1}{6} du = x^2 dx$

$= \frac{1}{6} \int u^4 du$

$= \frac{1}{6}\left(\frac{1}{5}\right)u^5 + C$

$= \frac{1}{30} u^5 + C = \frac{1}{30}(2x^3+5)^5 + C$

(8) $\displaystyle\int \frac{\overbrace{2x+1\,dx}^{du}}{\sqrt[4]{\underbrace{x^2+x}_{u}}}$

$u = x^2+x$

$du = (2x+1)dx$

$$= \int \frac{1}{\sqrt[4]{u}}\,du = \int u^{-1/4}\,du$$

$$= \frac{4}{3}u^{-\frac{1}{4}+\frac{4}{4}=\frac{3}{4}} + C$$

$$= \frac{4}{3}(x^2+x)^{3/4} + C$$

12 $f'(x) = 3x^2 e^{x^3}$ $\qquad (1, 5e)$

$\int 3x^2 e^{x^3} dx$ $\qquad f(x)$

$u = x^3$

$du = 3x^2 dx$

$\int e^u du = e^u + C = e^{x^3} + C$

$f(x) = e^{x^3} + C$ $\qquad \boxed{f(x) = e^{x^3} + 4e}$

$5e = e^{(1)^3} + C$

$5e = e + C$

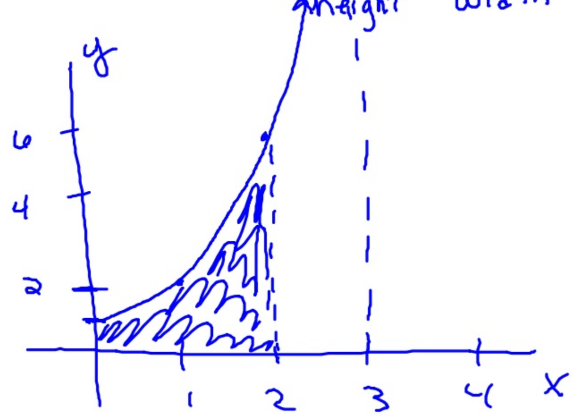
$-e \quad -e$

$4e = C$

9.3 Area and definite Integrals

$$\int \underbrace{f(x)}_{\text{height}} \underbrace{dx}_{\text{width}}$$

consider $f(x) = x^2 + 1$
and the area under the curve, above the x-axis from $x = 0$ and $x = 2$



When we have upper and lower bounds along the x-axis, this is a *definite* integral.

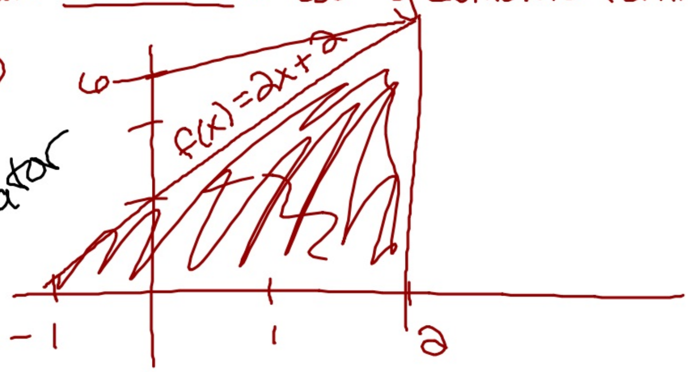
$\int_a^b f(x)\,dx$, where a is the lower bound and b is the upper bound.

$$\int_0^2 (x^2+1)\,dx =$$

fnInt$(x^2+1, x, 0, 2)$

we can <u>sometimes</u> use geometric formulas

1



$A = \frac{1}{2}bh$

$= \frac{1}{2}(6)(3) = 9$

HW 9G
p. 305 1-6
using calculator

2

$f(x) = \sqrt{16 - x^2}$

from $x = -4$ to $x = 4$

$A = \frac{1}{2}\pi r^2$

$A = 8\pi$