11. $f(x) = \dfrac{x^2+3}{x}$

$$\frac{x(2x)-(x^2+3)1}{x^2}$$

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

$$\frac{3}{4s^3} = \frac{0(4s^3)-3(s^2}{16s^6}$$

$$\frac{3}{4}\cdot\frac{1}{s^3} \qquad s^{-3} \qquad -\frac{9}{4}\cdot s^{-4}$$

$$\ln(x) \qquad \frac{d}{dx}\ln(x) = \frac{1}{x}$$

$$x^{-1} \qquad \frac{1}{0}x^0$$

$$\ln(x^2) = \frac{1}{x^2}\cdot 2x$$

$$\frac{d}{dx}(4x^3-x)^{10} = 10(4x^3-x)^9\cdot(12x^2-1)$$

$$\int_{-1}^{1} x^2\,dx \qquad \frac{1}{3}x^3+C\Big|_{-1}^{1}$$

$$\frac{1}{3}+\cancel{C} - \left(-\frac{1}{3}+\cancel{C}\right)$$

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

$f(x) = (x^2 + 3x - 5)^{10}$

$f'(x) = 10\,(x^2+3x-5)^9 \cdot (2x+3)$

$g(x) = 10\,(\overline{x^2+3x-5})^9 \cdot (2x+3)$

$\int g(x)\,\underline{dx}$

$10\,(u)^9$

$\int 10\,(u)^9\,du$

$\int 10\,(\underbrace{x^2+3x-5}_{u})^9 \cdot \underline{(2x+3)dx}$

$\frac{du}{dx} \cdot dx = du$

$2x+3$

$\int 10\,(u)^9 \cdot \frac{du}{\cancel{dx}} \cancel{dx}$

$\int 10\,(u)^9\,du$

u^{10}

$u^9 \quad \frac{1}{10} u^{10}$

$(x^2+3x-5)^{10}$

$\int \frac{\sin(\ln(x))}{x}\,dx$

$u = \ln(x)$

$\frac{du}{dx} = \frac{1}{x}$

$\int \frac{\sin(u)}{x}\,dx$

$\int \sin(u)\,\frac{1}{x}\,dx = \int \sin(u) \cdot \frac{du}{\cancel{dx}} \cdot \cancel{dx}$

$$\int \sin(u) \cdot du \qquad -\cos(u) + C$$

$$-\cos(\ln(x)) + C$$

$$-\cos(\ln(x)) + C$$

$$\sin(\ln(x)) \cdot \frac{1}{x}$$

$$\int \cos(2x)\, d\cancel{x} \qquad u = 2x$$

$$\frac{du}{dx} = 2$$

$$\int \cos(u)\, dx$$

$$\int \frac{1}{2}(2)\cos(u)\, dx$$

$$\int \frac{1}{2}\cos(u)\, \frac{du}{\cancel{dx}}\, \cancel{dx}$$

$$\int \frac{1}{2}\cos(u)\, du$$

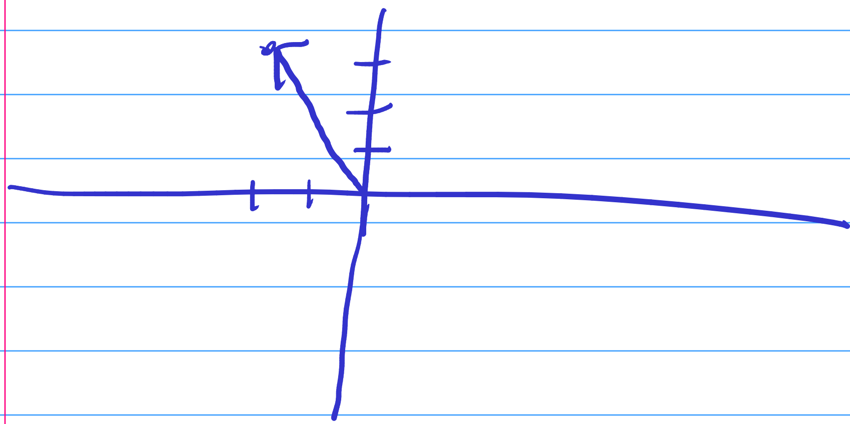
$$\frac{1}{2}\sin(u) + C \qquad \frac{d}{dx}\left(\frac{1}{2} f(x)\right)$$

$$= \frac{1}{2} f'(x)$$

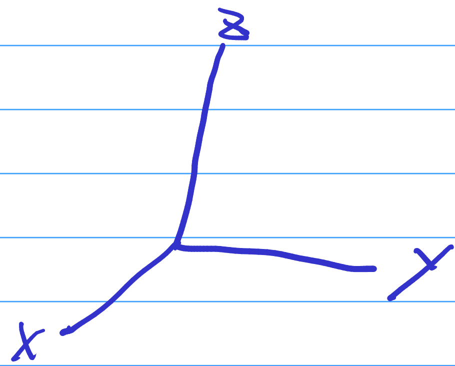
Vectors!

$\langle 0, 1, 3 \rangle$

$\langle -2, 3 \rangle$



$\langle a, b \rangle$
$+ \langle c, d \rangle$
$\langle a+c, b+d \rangle$



$\sqrt{x^2+y^2}$

$\vec{v}$ $\|\vec{v}\|$

$\sqrt{x^2+y^2+z^2}$

$\langle 2, -1, 4 \rangle$

$\sqrt{2^2+(-1)^2+4^2} = \sqrt{4+1+16} = \sqrt{21}$

$5\langle -1, 2\rangle$

$\langle -5, 10\rangle$

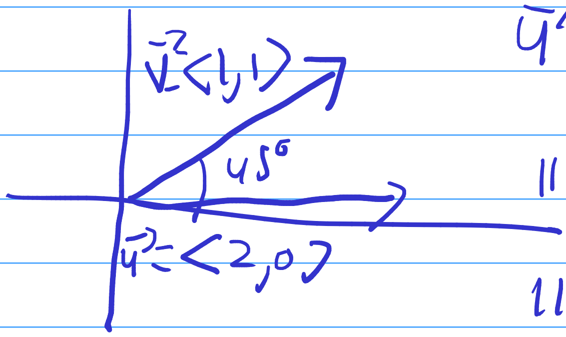
$\vec{u} = \langle a, b, c\rangle$

$\vec{v} = \langle d, e, f\rangle$

dot product

$\vec{u} \cdot \vec{v}$

$ad + be + cf$



$\vec{u} \cdot \vec{v} = 2 + 0 = 2$

$\|\vec{u}\| \sqrt{2^2 + 0^2} = 2$

$\|\vec{v}\| = \sqrt{2}$

$2 \cdot \sqrt{2} \cdot \cos 45° \quad 2 \cdot \sqrt{2} \cdot \frac{\sqrt{2}}{2} = \frac{4}{2} = 2$

$\sqrt{\vec{u} \cdot \vec{u}} = \|\vec{u}\|$

unit vector

$\langle 1, 0, 0\rangle \qquad \langle \frac{3}{5}, \frac{4}{5}\rangle$

$\vec{u}$ $\quad \langle 0,1,3 \rangle \quad \sqrt{10}$

$\dfrac{\vec{u}}{\|\vec{u}\|} \quad \left\langle \dfrac{0}{\sqrt{10}}, \dfrac{1}{\sqrt{10}}, \dfrac{3}{\sqrt{10}} \right\rangle$

$\hat{u}$: unit vector pointing the same way as u

3D

$\hat{i} = \langle 1, 0, 0 \rangle$

$\hat{j} = \langle 0, 1, 0 \rangle$

$\hat{k} = \langle 0, 0, 1 \rangle$

2D

$\hat{i} = \langle 1, 0 \rangle$

$\hat{j} = \langle 0, 1 \rangle$

$\langle 0, 1, 3 \rangle$

$(0)(\hat{i}) + (1)(\hat{j}) + (3)(\hat{k})$

$\hat{j} + 3\hat{k}$