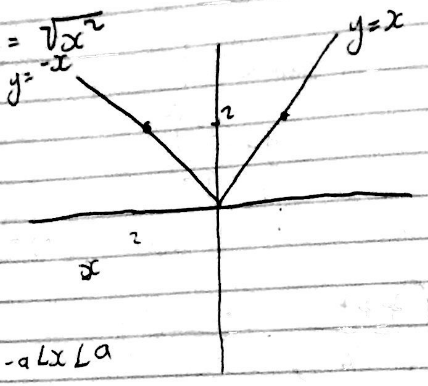
$\left\{ -x;\ x < 0 \right.$

definition of absolute using the definition when find roots inequality

$|x| = \sqrt{x^2}$



$-a < x < a$

domain $x \in (-\infty; \infty)$ and range $(0; \infty)$

$2 = |2x-7| : 2x-7;$ $\quad 2x-7 \geq 0$ restriction

$x \geq \frac{7}{2}$

$2 = 2x-7$

$9 = 2x$ ✓

$x = \frac{9}{2}$

or

$2x-7 < 0$ ✓

$x = < \frac{7}{2}$

$2 = -(2x-7)$

$2 = -2x+7$

$-5 = -2x$ ✓

$x = \frac{5}{2}$

equation satisfied.

Example 1.2.5

① $|x-1| < 2$

$x-1 < 2$; $x-1 \geq 0$

$x < 3$ ✓ $\quad x \geq 1$ ✓

$\therefore 1 \leq x < 3$

and

$-1 < x < 1$

② $|x-1| < 2$ $\quad -(x-1)$

$-(x-1) < 2$ $\quad x-1 < 0$

$-x+1 < 2 \quad -1 < x$ ✓ $\quad x < 1$ ✓

$f(x) = x$

$g(y) = y$

$xy = |x| \cdot |y|$

but $|xy| = xy$

$\therefore |xy| = |x| \cdot |y|$

1.3 composis

→ A function with in a function.

$(f \circ g)(x) = f(g(x))$ mean its the out side function

$x \in D_g$ → Domain of g

$y = g(x)$

y value is domain of f

Example 1.3.2

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

$g(1) = \frac{1}{1-3} = -\frac{1}{2}$ $\qquad f(g(1)) = 2\left(-\frac{1}{2}\right)+1$

$= 0$

$g(f(2))$

$f(2) = 2(2)+1$

$= 5$

$g(f(2)) = \frac{1}{5-3}$

$= \frac{1}{2}$

$f(g(x))$

$f(g(x)) = 2\left(\frac{1}{x-3}\right)+1$ $\qquad g(f(x)) = \frac{1}{(2x+1)-3}$

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

$\frac{2+(x-3)}{x-3}$ $\qquad f(f(x)) = \cancel{2x+}$

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

$= \frac{x-1}{x-3}$ $\qquad = 4x+2+1$

$= 4x+3$

$$y= \quad \frac{dy}{dx} = (3x^2+3)\sin x + (x^3+3x).\cos x$$

3.1.5

$y = u(x).v(x).w(x)$

$$\frac{dy}{dx} = \frac{d(uv)}{dx} w + uv.\frac{dw}{dx}$$

but $\frac{d}{dx}(u.v) = \frac{dy}{dx} v + u\frac{dv}{dx}$

$$\frac{dy}{dx} = \left(\frac{du}{dx}v + u\frac{dv}{dx}\right)w + uv\frac{dw}{dx}$$

$$\boxed{= \frac{dy}{dx}vw + uw\frac{dv}{dx} + uv\frac{dw}{dx}}$$

product of 3 functions

3.1.6

$y = x^2(x+1)\cos x$

$x^2(x+1) = x^3+x^2$

$$\frac{dy}{dx} = 2x(x+1)\cos x + x^2\cos x(1) + x^2(x+1)[\sin x)$$

derivative

derivative of $(x+1)$ (1)

derivative of $\cos x$

do it pk

eg 3.1.7

the derivative of quotient of two functions

$$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{f'(x)g(x) - f(x)g'(x)}{g(x)^2}$$

3.2.2

$$\frac{dy}{dx} = \frac{[-6x](5x^4+2) - (1-3x^2)[20x^3]}{(5x^4+2)^2}$$

Ex 3.2.3

$$\frac{dy}{dt} = \frac{-\sin t(\sin t - t^2) - \cos t(\cos t - 2t)}{(\sin t - t^2)^2}$$

Example 3.2.4

$y = \tan x$

$= \frac{\sin x}{\cos x}$

$$\frac{dy}{dx} = \frac{\cos x.\cos x - \sin x.[-\sin x]}{\cos^2 x}$$

$$= \frac{1}{\cos^2 x} = \sec^2 x$$

derivative of $\tan x$

$\tan x = \sec^2 x$

Homework

$\frac{\cos x}{\sin x}$ $\quad \frac{1}{\cos x}$ $\quad \frac{1}{\sin x}$

Example 4.4.3

Area $= \int_1^3 -2(x-3)\,dx =$

$$= -\frac{1}{3}x^3 + \frac{3}{2}x^2\Big]_1^3 = -\frac{1}{3}(3)^3 + \frac{3}{2}(3)^2 - \left(-\frac{1}{3}(1)^3 + \frac{3}{2}(1)^2\right)$$

$$= -9 + \frac{27}{2} + \frac{1}{3} - \frac{3}{3} = 3\frac{1}{3}$$

Example 4.4.4)

Area $= \int_{-2}^{-1} (x-1)(x+1)(x+2)\,dx + \int_{-1}^{1} -(x-1)(x+1)(x+2)\,dx +$

$\int_1^2 (x-1)(x+1)(x+2)\,dx$

we can multiply all the way through as there is no product rule for integration

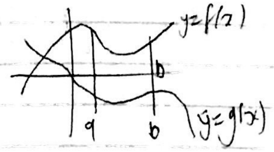
$$= \frac{1}{4}x^4 + \frac{2}{3}x^3 - \frac{1}{2}x^2 - 2x\Big]_{-2}^{-1} - \left[\frac{1}{4}x^4 + \frac{2}{3}x^3 - \frac{1}{2}x^2 - 2x\right]_{-1}^{1}$$

$$+ \left[\frac{1}{4}x^4 + \frac{2}{3}x^3 - \frac{1}{2}x^2 - 2x\right]_1^2$$

$= 8$

4.4.1 Area between curves

$f(x)$ and $g(x)$ $\quad f(x) \geq g(x)$



Area $= \int_a^b (f(x)+c)\,dx - \int_a^b (g(x)+c)\,dx$ (top curve - bottom curve)

$$\int_a^b (f(x)+c-g(x)-c)\,dx$$

$$= \int_a^b (f(x)-g(x))\,dx$$

$$\cancel{= \int_1^2 [e^x - (2x-1)}$$

Example 4.4.5

$$= \int_1^2 [e^x - (2x-1)]\,dx$$

Area $= \int_1^2 e^x - 2x + 1 \cdot dx$

$$= e^x - \frac{2}{2}x^2 + x\Big]_1^2$$

$$= e^2 - (2)^2 + 2 - [e^1 - (1)^2 + 1] = e^2 - e^1 - 2$$