[illegible]
[illegible]
[illegible]

1. $y = \frac{1}{x-2}$

* The function is defined for all real numbers except $x = 2$
* The domain is a set of real numbers except $x = 2$
* The codomain is a set of real numbers except $y = 0$

2) $K = \ln v$

$\frac{dK}{dv} = \frac{1}{v}$

3) $2x - 3y - 2 = 0$

$-3y = 2 - 2x$

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

$y = \frac{2x+2}{3} = \frac{2}{3}[x+1]$

4) $x^2 + y^2 = 4$

$y^2 = 4 - x^2$

$y = \pm\sqrt{4 - x^2}$

$\boxed{5}$ $p = \frac{t}{\sin}$, $t = \sin p$ --- *

$\frac{dt}{dp} = \cos p$; $\frac{dp}{dt} = \frac{1}{\cos p}$

Recall, $\cos^2 y + \sin^2 y = 1$

$\cos y = \pm\sqrt{1 - \sin^2 y}$

$t = \sin p$

$\therefore \cos p = \sqrt{1 - t^2}$

Hence $dp/dt = 1/\{1 - t^2\}$.

5. $F(x) = 2x^2 - 5$

$g[x] = 4x - 2$

$fog[x]\ 2[4x-2]^2 - 5$

$= 2[16x^2 - 16x + 4] - 5$

$= 32x^2 - 32x + 8 - 5$

$= 32x^2 - 32x + 3$

$gof[x] = 4[2x^2 - 5] - 2$

$= 8x^2 - 20 - 2$

$= 8x^2 - 22$

6 show that $f[x] = f_e[x] + f_o[x]$

$F[x] = 3x^2 - 2x + 1$

$f_e(x) = \dfrac{f[x] + F[-x]}{2}$

$F[-x] = 3[-x]^2 - 2[-x] + 1$

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

$f_e(x) = \dfrac{3x^2 - 2x + 1 - [3x^2 + 2x + 1]}{2}$

$F[-x] = 3[-x]^2 - 2[-x] + 1$

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

$F_e[x] = \dfrac{3x^2 - 2x + 1 - [3x^2 + 2x + 1]}{2}$

$= -4x/2 = -2x$

$F_e[x] + F[x] = 3x^2 + 1 - 2x$

$= 3x - 2x + 1$

7. Differentiate $y = \cos x$

$y + \delta y = \cos[x + dx]$

$\delta y = \cos[x + \delta x] - \cos x$ — ①

Recall

$\cos[A+B] - \cos[A-B] = 2 \sin A \sin B$ --- ②

comparing ① & ②

$A + B = x + \delta x$ -- ③

$A - B = x$ — ④

Adding 3 & 4 & subtracting ③ and ④

$2A = 2x + \delta x$

$2A = 2x + \delta x$

$A = \frac{2x + \delta x}{2}$

$\boxed{B = \delta x/2}$

$\boxed{A = x + \delta x/2}$

Comparing (1) & (2)

$dy = \cos \qquad - \cos x$

$= \sin[x + \delta x/2] \sin[\delta x/2]$

Dividing through δx

$\frac{\delta y}{\delta x} = \frac{-\sin[x + \delta x/2] \sin[\delta x/2]}{\delta x}$

$\frac{\delta y}{\delta x} = \frac{\sin x [x + \delta x/2] \sin \delta x/2]}{\delta x/2}$

$= -\sin[x + \delta x/2] \times \frac{\sin[\delta x/2]}{\delta x/2}$

Taking limit $\delta x \rightarrow 0$

$\lim_{\delta x \rightarrow 0} \frac{\sin \delta x/2}{\delta x/2} = 1$

$\delta y/d\delta x = -\sin[x + 0/2] \times 1$

$\lim_{\delta x \rightarrow 0} \delta y/\delta x = -\sin x$

3 $y = 3t^2 ; x = 1/t^2$

$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$

$= dy/dt \div dx/dt$

$dy/dt = 6t \; ; \; dx/dt = -2/t^3$

$dy/dx = 6t \div -2/t^3$

$= 6t \times \frac{-2}{t^3} = \frac{6x-2}{t^2} = \frac{12}{t^2}$

$dy/dx = -12/t^2 = 2$

9 $y = x^2 \cos 2x \; e^{4x}$

Solution

Taking $\log_e$ of both sides

$\ln y = \ln x^2 + \ln \cos 2x + \ln e^{4x}$

Differentiating both w.r.t x

$\frac{1}{y}\frac{dy}{dx} = \frac{1}{x^2}[2x] + \frac{1}{\cos 2x}[-2\sin 2x] + 4$

$\frac{1}{y}\frac{dy}{dx} = \frac{2}{x} - \frac{2\sin 2x}{\cos 2x} + 4$

multiplying both sides by y

$\frac{dy}{dx} = y\left[\frac{2}{x} - \frac{2\sin 2x}{\cos 2x} + 4\right.$

$\frac{dy}{dx} = x^2 \cos 2x e^{4x} \times \frac{2}{x} - 2\frac{\sin x}{\cos x} +$

10 $y = \sin[3x^3 + 5]$

Let $u = 3x^3 + 5$

$\frac{dy}{dx} = \cancel{\cos u} \; \cos u$

$\frac{du}{dx} = 9x^2$

$\frac{dy}{dx} = \frac{dy}{du} - \frac{du}{dx}$

$= \cos u \times 9x^2$

$= 9x^2 \cos u$

$= 9x^2 \cos 3u^3 + 5$