Exercise 2.2

1. Which of the following are algebraic, exponential, logarithmic, trigonometric, inverse trigonometric, hyperbolic and inverse hyperbolic functions.

(i) $y = x^2 + 5x + 6$ algebraic

(ii) $f(x) = \tan^{-1}x$ inverse trigonometric.

(iii) $y = 2^{x+1}$ exponential

(iv) $y = \log_5(x+2)$ logarithmic

(v) $f(x) = 3\sin x$ trigonometric

(vi) $y = a^{\sin x}$ exponential.

(vii) $f(x) = \dfrac{x^2+5x+7}{x+9}$ algebraic

(viii) $f(x) = \dfrac{\sin x}{\sec x}$ trigonometric.

(ix) $y = \log_a \sin x$ logarithmic

(x) $f(x) = \text{cosec}^{-1}\sqrt{x^2-1}$ inverse trigonometric

(xi) $f(x) = \tan(\sin x)$ trigonometric

(xii) $y = \dfrac{x}{x+3}$ algebraic.

(xiii) $f(x) = \sinh x$ hyperbolic

(xiv) $y = ln\ cosh\ x$ logarithmic

(xv) $y = \tan h^{-1}x$ inverse hyperbolic.

(xvi) $y = \cos^{-1}(\ln x)$ inverse trigonometric.

2. Identify, whether the y is the explicit or implicit function of independent variable x if:

(i) $xy^2 + 5xy + 7 = 0$

(ii) $y = 3x^2 - 3x + 5$

(iii) $yx^2 + y^2x = 3 - 5y$

(iv) $x^2 + xy^2 = 2 + 3xy$

(v) $y = \dfrac{x+3}{x^2+5}$

(vi) $\dfrac{x}{y} = 3x^3y - 5$

(i) $xy^2+5xy+7=0$ implicit.

(ii) $y = 3x^2-3x+5$ explicit

(iii) $yx^2+y^2x = 3-5y$ implicit

(iv) $x^2+xy^2 = 2+3xy$ implicit

(v) $y = \dfrac{x+3}{x^2+5}$ explicit

(vi) $\dfrac{x}{y} = 3x^3y - 5$

$x = 3x^3y^2 - 5y$ implicit.

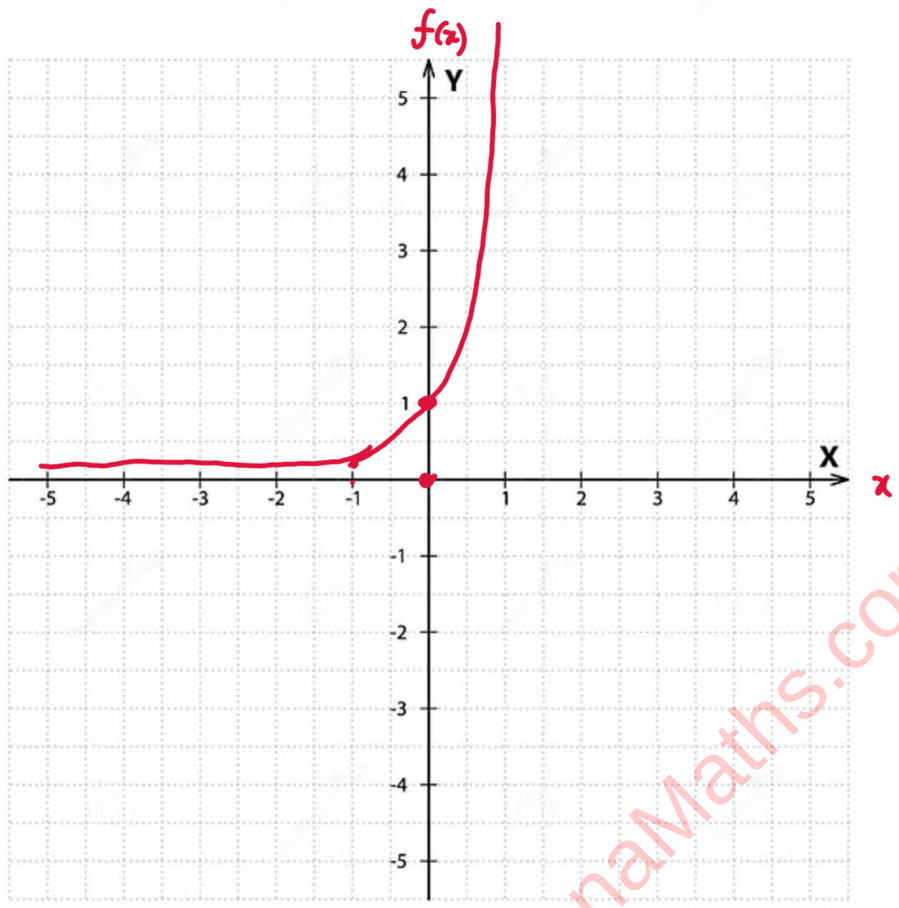
3. Draw the graph of the following functions:

(i) $f(x) = e^{3x}$ (ii) $f(x) = 3log_{10}x$

(iii) $y = \sqrt{36 - x^2}$ (iv) $\frac{x^2}{16} + \frac{y^2}{25} = 1$

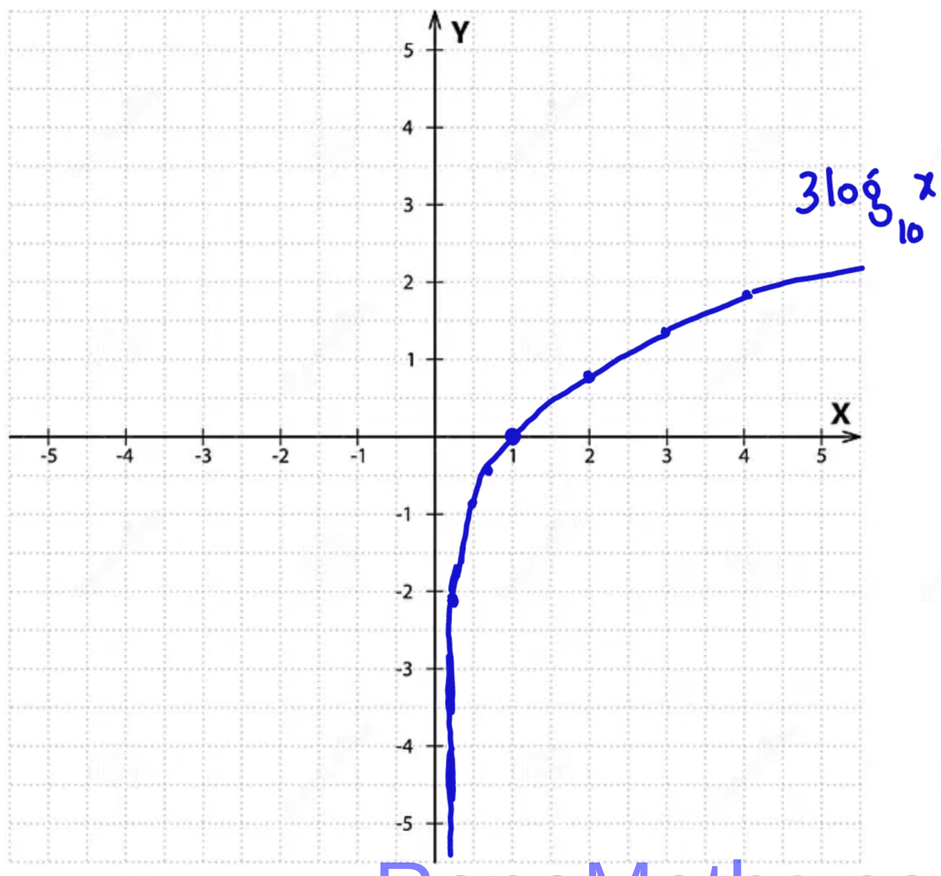
(i) $f(x) = e^{3x}$

x	-4	-3	-2	-1	0	1	2	3	4
f(x)				0.0498	1	20.08	403.43		



(ii) $f(x) = 3\log_{10} x$

x	0	0.2	0.5	0.7	0.9	1	2	3	4
f(x)	X	-2.1	-0.9	-0.46	-0.137	0	0.9	1.43	1.8

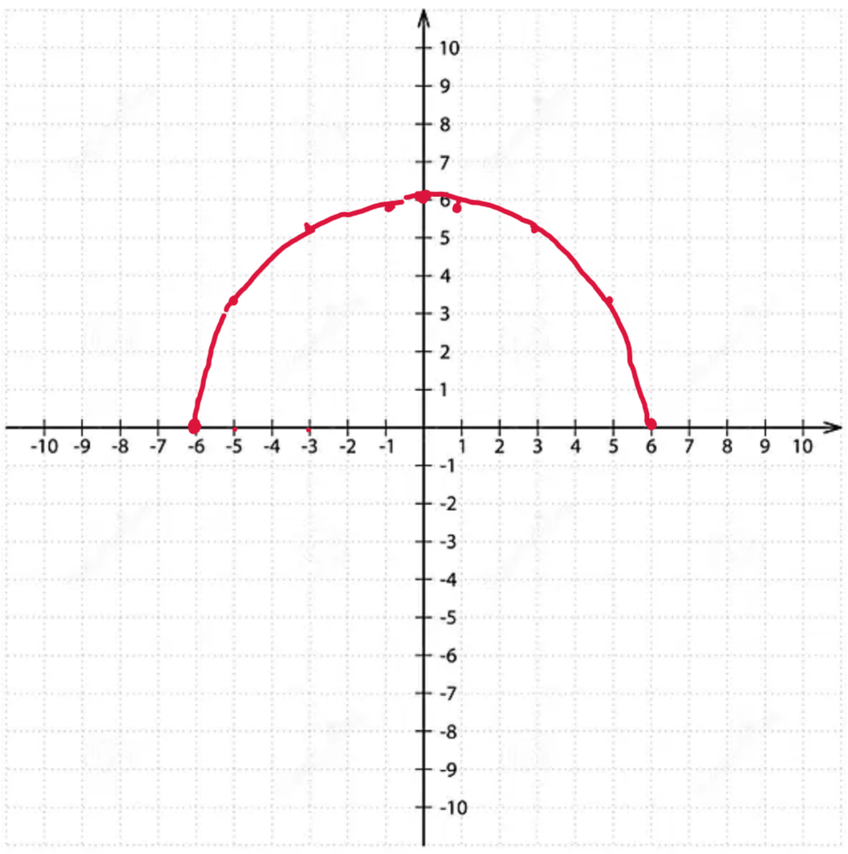


(iii) $y = \sqrt{36 - x^2}$

$36 - x^2 = 0$

$x = \pm 6.$

x	−6	−5	−3	−1	0	1	3	5	6
y	0	3.31	5.2	5.9	6	5.9	5.2	3.31	0

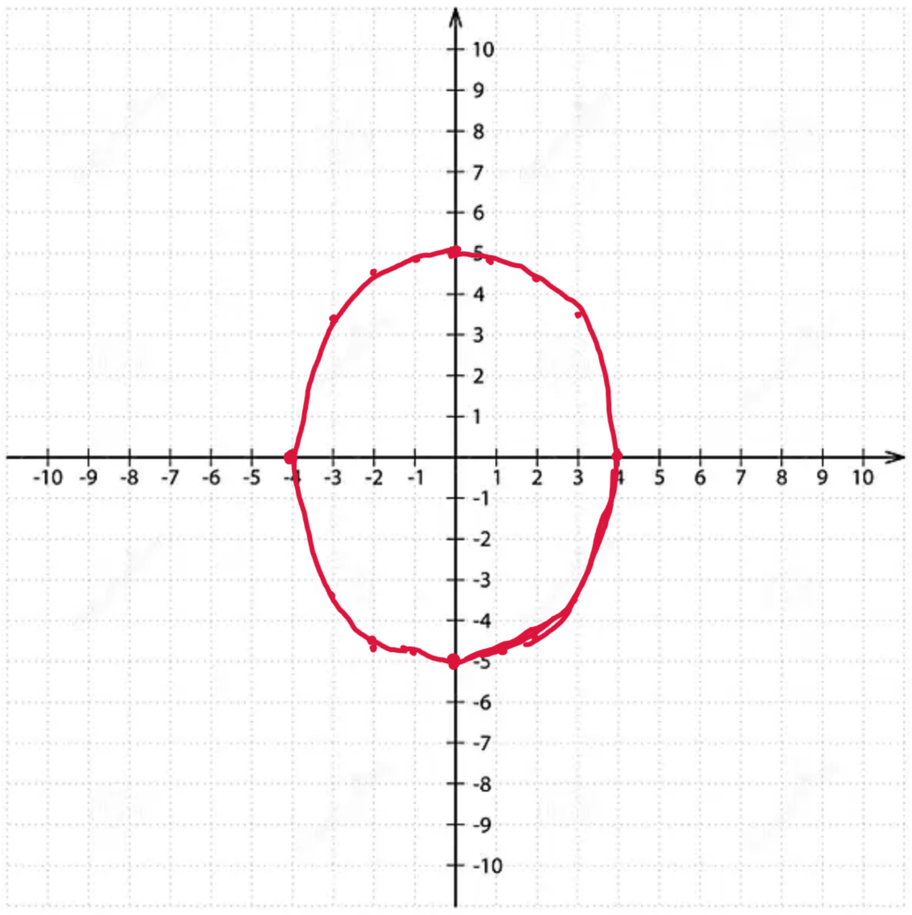


(iv) $\frac{x^2}{16} + \frac{y^2}{25} = 1 \Rightarrow \frac{y^2}{25} = 1 - \frac{x^2}{16} = \frac{16 - x^2}{16}$

$y^2 = \frac{25}{16}(16 - x^2)$

$y = \pm \frac{5}{4}\sqrt{16 - x^2}$

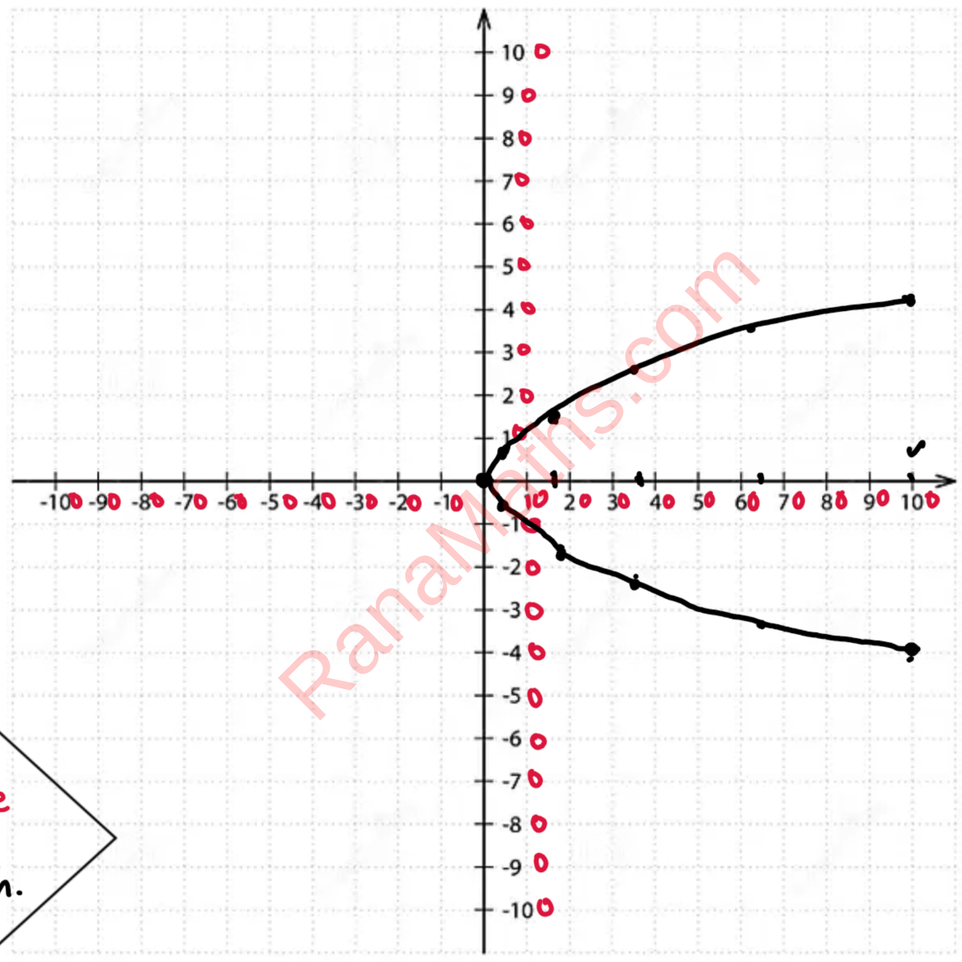
x	−4	−3	−2	−1	0	1	2	3	4
y	±0	±3.3	±4.33	±4.8	±5	±4.8	±4.33	±3.3	±0



4. Draw the graph of parametric equations of function $x = at^2$, $y = 2at$, when $a = 4$ and $-5 \leq t \leq 5$

$x = 4t^2$, $y = 8t$ $\quad -5 \leq t \leq 5$

t	-5	-4	-3	-2	-1	0	1	2	3	4	5
x	100	64	36	16	4	0	4	16	36	64	100
y	-40	-32	-24	-16	-8	0	8	16	24	32	40

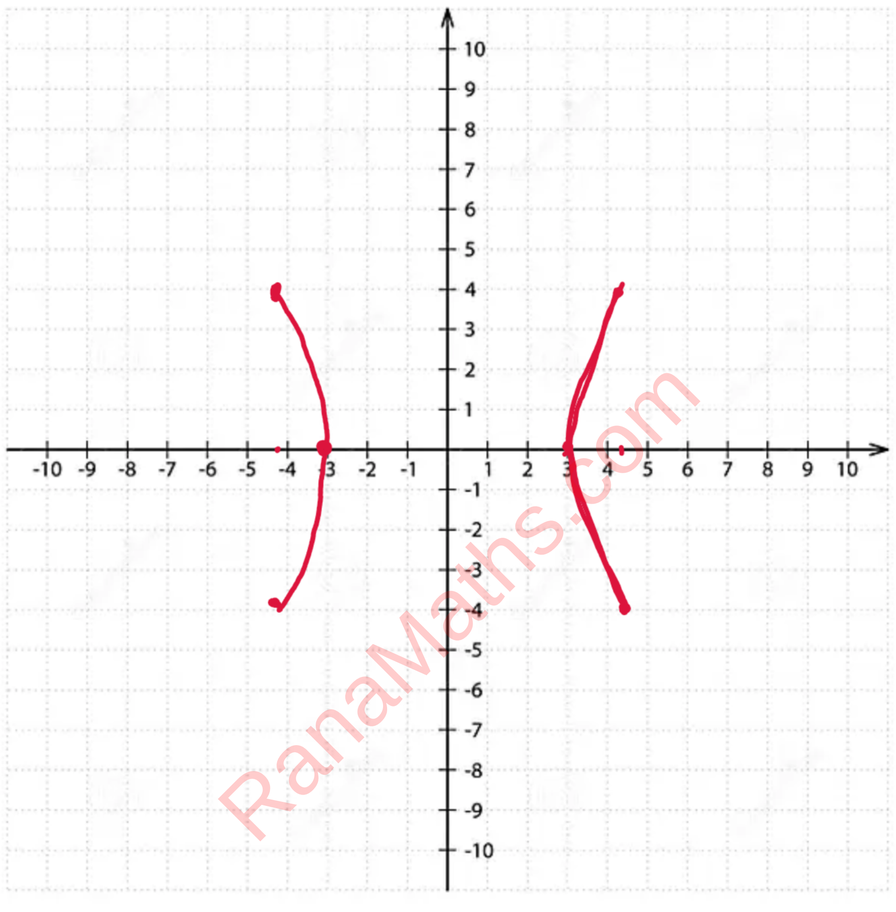


5. Draw the graph of parametric equations of function
$x = a\sec\theta,\ y = b\tan\theta$, when $a = 3, b = 4$ and $-\pi \leq \theta \leq \pi$

$x = 3\sec\theta,\ y = 4\tan\theta,\quad -\pi \leq \theta \leq \pi$

$x = \frac{3}{\cos\theta}$

θ	-180°		-135	-90°	-45°	0	45°	90°	135°		180°
x	-3		-4.2	undefined.	4.2	3	4.2	undefined	-4.2		-3
y	0		4	undefined.	-4	0	4	undefined	-4		0



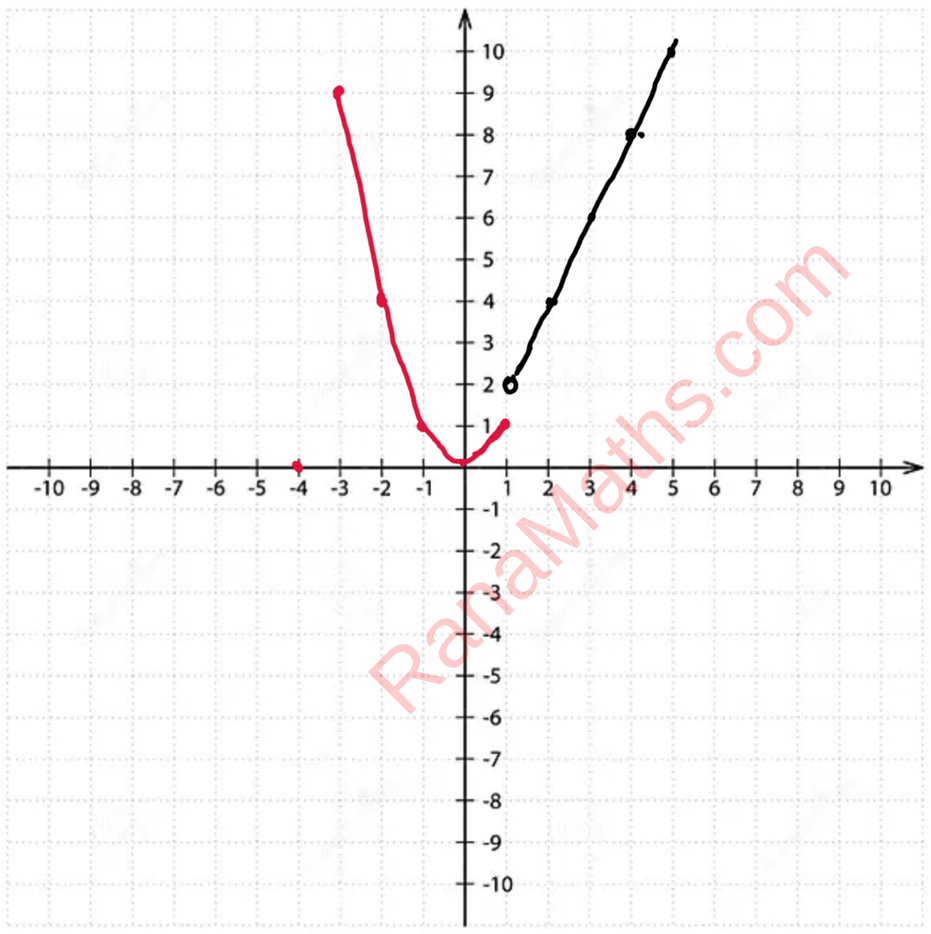
6. Draw the graph of the $f(x) = \begin{cases} x^2 & x \leq 1 \\ 2x & x > 1 \end{cases}$

$f(x) = x^2$, $x \leq 1$ Quadratic (parabola)

x	-4	-3	-2	-1	0	1
f(x)	16	9	4	1	0	1

$f(x) = 2x$, $x > 1$ Linear (Line)

x	1.0001	2	3	4	5	6
f(x)	2.0002	4	6	8	10	12



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