1. $d = \sqrt{(2\sqrt{2})^2+2^2}$
   $= \sqrt{8+4}$
   $= \sqrt{12}$
   $= 2\sqrt{3}$

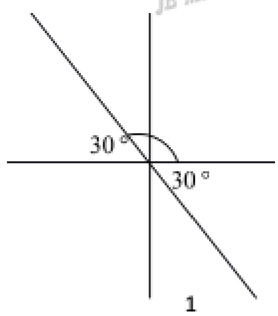
2. $d = \sqrt{(4)^2+(2\sqrt{3})^2}$
   $= \sqrt{16+12}$
   $=\sqrt{28}$
   $=2\sqrt{7} = r$
   Circle equation: $(x+5)^2+(y+\sqrt{3})^2=28$

3. If A(-3, 6), find the coordinate of B.
   Let B(x, y)
   $(x-3)/2=-1$ $\qquad$ $(y+6)/2=2$
   $x-3=-2$ $\qquad$ $y+6=4$
   $x=1$ $\qquad$ $y = -2$
   ans: B(1, -2)

4. Let R(x, y)
   $(x+4)/2=8$ $\qquad$ $(y-7)/2=-2$
   $x+4=16$ $\qquad$ $y-7=-4$
   $x=12$ $\qquad$ $y = 3$
   ans: R(12, 3)

5. inverse point: $Q(2, 2\sqrt{2})$
   $m = (2-2\sqrt{2})/(2\sqrt{2}-2)$
   $= 2(1-\sqrt{2})/2(\sqrt{2}-1)$
   $= -1$

6. $\tan\alpha=-\sqrt{3}/3$
   $\alpha = 150^\circ$



7.

(a) $m_{AB=}m_{PQ}$
$(k-4)/(1+2)=-3$
$k-4=-9$
$k=-5$

(b) $m_{AB} \times m_{PQ} = -1$
$(k-4)/(1+2)\times-3=-1$
$k-4=1$
$k=5$

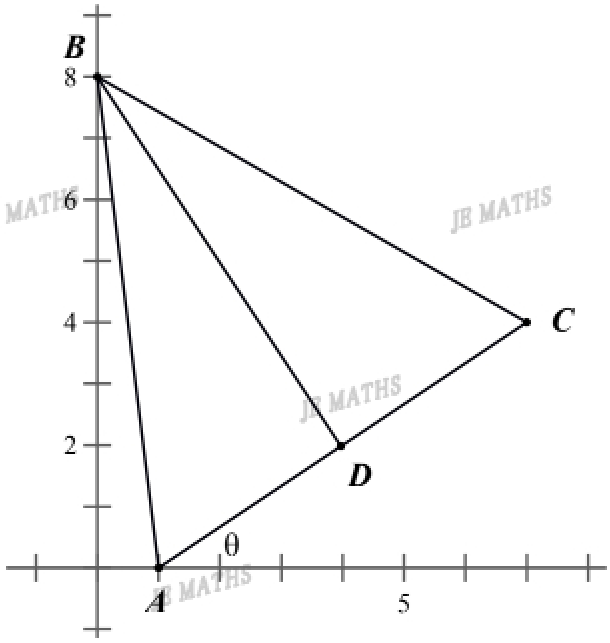
8.

(a) $4/(k+2)=(k-3)/-1$
$-4=(k-3)(k+2)$
$k^2k-6+4=0$
$k^2k-2=0$
$(k-2)(k+1)=0$
$k=2, -1$

(b) $4/(k+2)\times(k-3)/-1=-1$
$4(k-3)/(k+2)=1$
$4k-12=k+2$
$3k=14$
$k=14/3$

9.

(a) Plot.



(b) A(1, 0) and C(7, 4)
$m_{AC}=4/6=2/3=\tan\Theta$
$\Theta=33.69\ldots=34^\circ$

(c) $y-0=2/3(x-1)$
$3y=2x-2$
$2x-3y-2=0$

(d) $D((1+7)/2, (0+4)/2)$
$=D(4, 2)$

(c) (i)
$d_{AB}=\sqrt{(1^2+8^2)}=\sqrt{65}$
$d_{BC}=\sqrt{(7^2+4^2)}=\sqrt{65}$
$AB = BC$

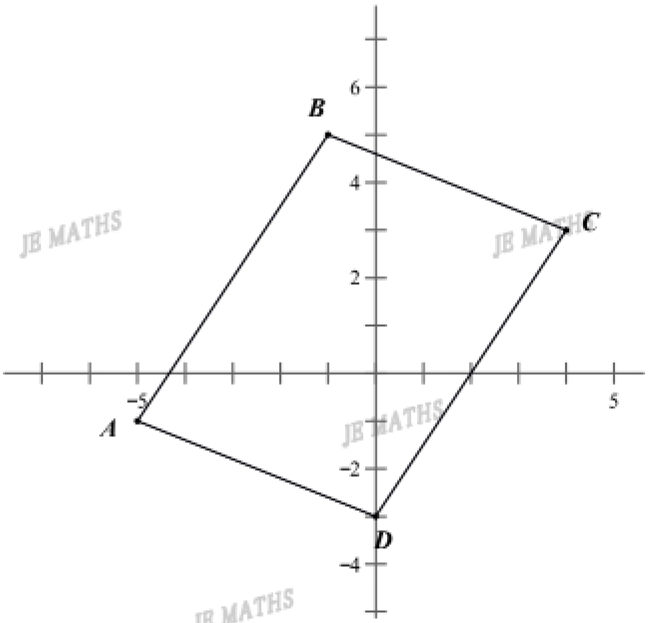
(ii)
$m_{AC}=2/3$, $m_{BD}=(8-2)/(0-4)=-3/2$
$m_{AC}\times m_{BD}=2/3\times -3/2=-1$
$AC\perp BD$

(f) isosceles triangle

(g) $d_{AC}=\sqrt{(6^2+4^2)}=\sqrt{52}$
$d_{BD}=\sqrt{(4^2+6^2)}=\sqrt{52}$
$A = \frac{1}{2}\times AC\times BD$
$= \frac{1}{2}\times\sqrt{52}\times\sqrt{52}$
$= 26\ u^2$

10.

(a) A(-5, -1)→B(-1, 5) [4, 6]
D(0, -3) → C($\underline{4}$, $\underline{3}$) [4, 6]
ans: C(4, 3)



(b) $m_{BD}=8/-1=-8$
$y+3=-8(x-0)$
$8x+y+3=0$

(c) (i) $d_{BD}=\sqrt{(1^2+8^2)}=\sqrt{65}$

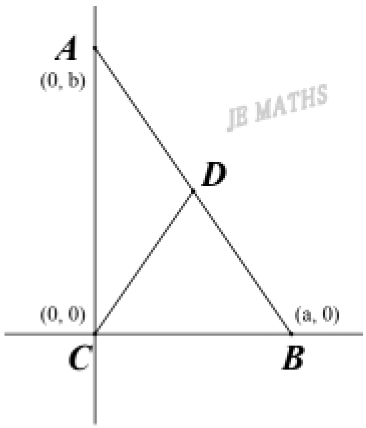
(ii) $d_{AB}=\sqrt{(4^2+6^2)}=\sqrt{52}$

(iii) $d_{AD}=\sqrt{(5^2+2^2)}=\sqrt{29}$

(d) In ΔABD,
$\cos\angle A=[(\sqrt{52})^2+(\sqrt{29})^2-(65)^2]/(2\sqrt{52}\sqrt{29})$
$\angle A=78^\circ 6' 40.83''$
$= 78^\circ 7'$

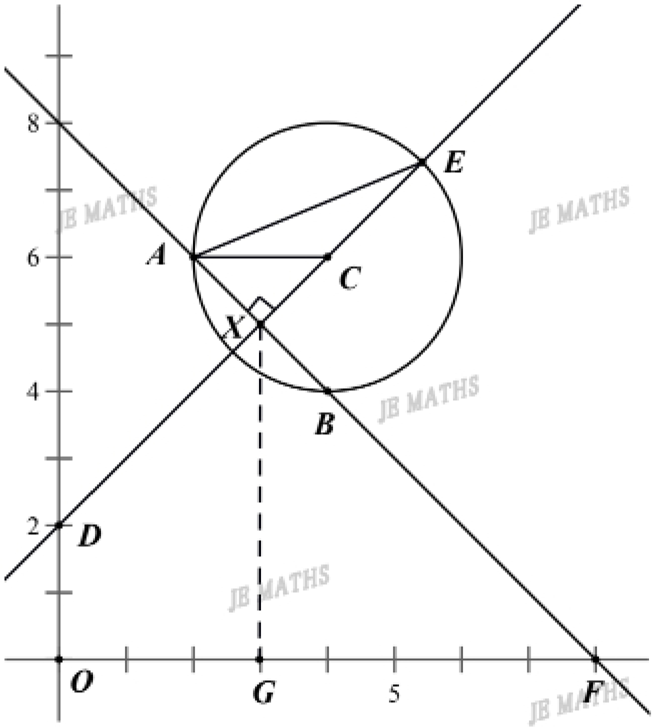
(c) Area(ABCD) = $2\times\Delta ABD$
$= 2\times(½\times\sqrt{52}\times\sqrt{29}\times\sin 78^\circ 7')$
$= 38.00007\ldots = 38\ u^2$

11. Construct: make a right angle triangle ABC with C at the origin, A(0, b) and B(a, 0)
Proof: DA=DC=DB
since D is the midpt of AB, D(a/2, b/2)
Use distance formula to find:
$DA=\sqrt{[(a/2-0)^2+(b/2-b)^2]}=\sqrt{(a^2/4+b^2/4)}$ 1)
$DC=\sqrt{[(a/2-0)^2+(b/2-0)^2]}=\sqrt{(a^2/4+b^2/4)}$ 2)
$DA=\sqrt{[(a/2-a)^2+(b/2-0)^2]}=\sqrt{(a^2/4+b^2/4)}$ 3)
From 1), 2) and 3): DA=DC=DB



12.

(a) Sketch.



(b) $(x-4)^2+(y-6)^2=4$

(c) $(x-4)^2+(y-6)^2=4$ 1)

$y = 8-x$ 2)

$(x-4)^2+(8-x-6)^2=4$

$(x-4)^2+(x-2)^2=4$

$x^2-8x+16+x^2-4x+4=4$

$2x^2-12x+16=0$

$x^2-6x+8=0$

$(x-2)(x-4)=0$

$x=2$, $y=6 \rightarrow A(2, 6)$

$x=4$, $y=4 \rightarrow B(4, 4)$

(d) midpoint X: $((2+4)/2, (4+6)/2)$

$A(2, 6)$ and $B(4, 4)$, $m_{AB}=2/-2=-1$

$m_{XC}=1$ $(m_{AB} \times m_{XC} = -1)$

mid-point $X((2+4)/2,(6+4)/2)=X(3, 5)$

l_{XC}: $y-5=1 \times (x-3)$

$y-5=x-3$

$x-y+2=0$

l_{XC}: $x-y+2=0$

(c) (i)

sub $x=0$ in $x-y+2=0$

$D(0, 2)$

sub $y=0$ in $x+y=8$

$F(8, 0)$

(ii)

$A_{DOGX} = \frac{1}{2} \times 3 \times (2+5)=21/2$

$A_{XGF} = \frac{1}{2} \times 5 \times 5=25/2$

$A_{DEFO} = A_{DOGX} + A_{XGF}$

$= 21/2+25/2$

$= 46/2$

$= 23 \text{ u}^2$

(f) A (2, 6), X(3, 5), C(4, 6)

$d_{AX}=\sqrt{(1^2+1^2)}=\sqrt{2}$

$d_{XC}=\sqrt{(1^2+1^2)}=\sqrt{2}$

$AX = XC = \sqrt{2}$

$AX \perp AB$ (given)

ans: ΔAXC is an isosceles right angle triangle

(g) $\angle XAC = \angle XCA$ (equal angles opposite to equal sides)

$\angle ACX = (180-90)/2$ (angle sum of a triangle)

$=45^\circ$

(h) $AC = CE$ (radii of circle)

$\angle EAC=\angle AEC$ (equal angles opposite to equal sides)

$\angle ACX=2\angle AEC$ (exterior angle of a triangle)

$\angle AEC = 45^\circ/2=22.5^\circ=22^\circ 30'$

(i) In ΔAXE,

$AX = \sqrt{2}$

$XE = CX+EX = 2+\sqrt{2}$

$AE = \sqrt{(AX^2+XE^2)}$

$= \sqrt{[(\sqrt{2})^2+(1+\sqrt{2})^2]}$

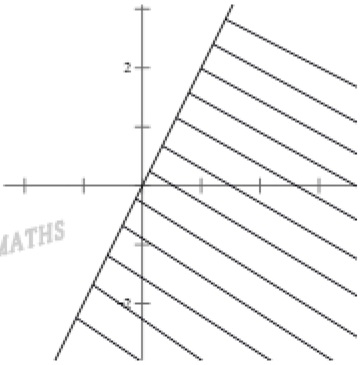
$= \sqrt{(8+4\sqrt{2})}$ $(AE>0)$

$= 2\sqrt{(1+\sqrt{2})}$

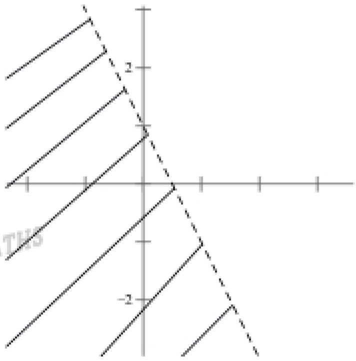
$\cos 22^\circ 30' = EX/AE$

$= (2+\sqrt{2})/2\sqrt{(1+\sqrt{2})}$

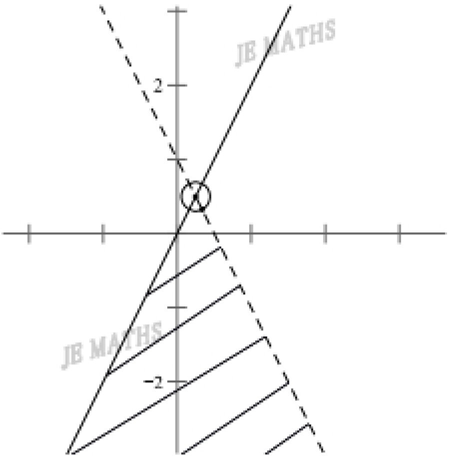
13. (a) (i)



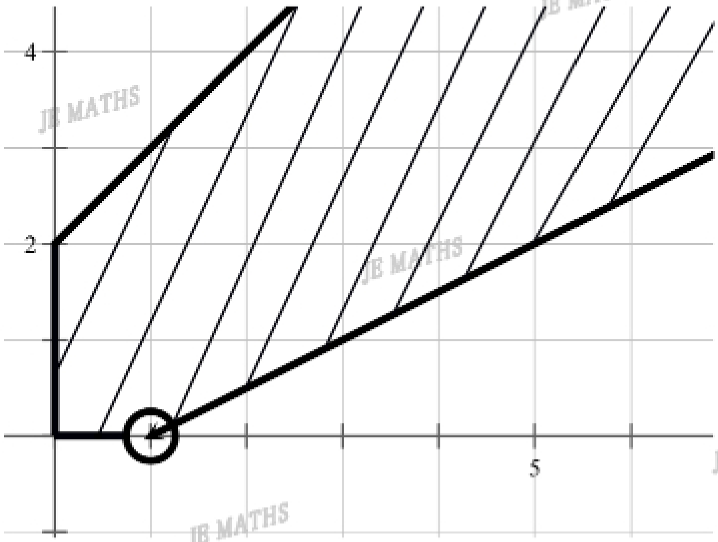
(ii)



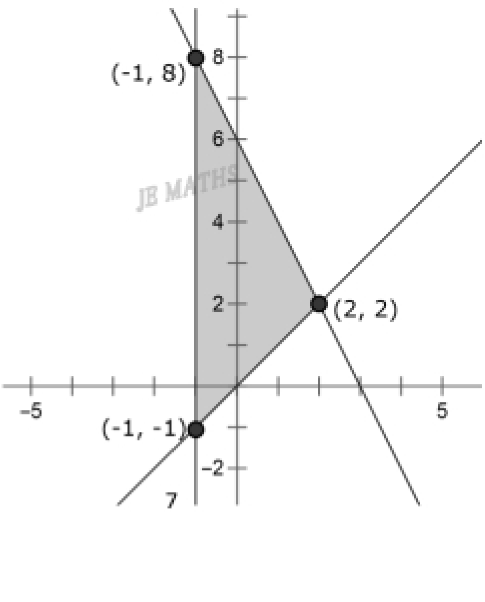
(b)



14.

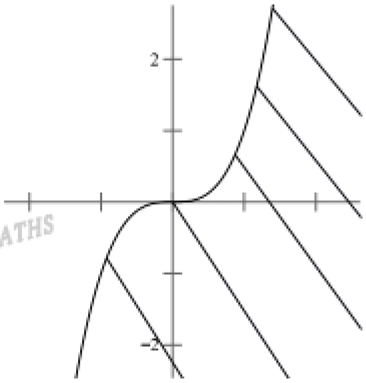


15. (a) Sketch.

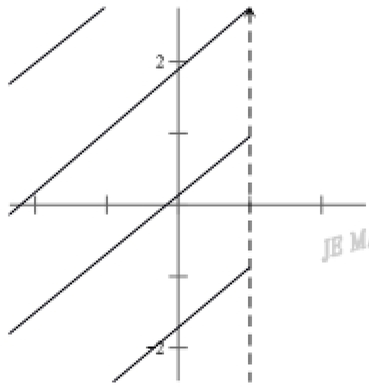


(b) $A=1/2\times 9\times 3=27/2$ u ²

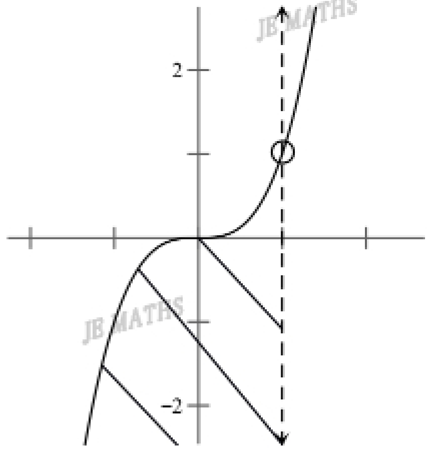
16. (a) (i)



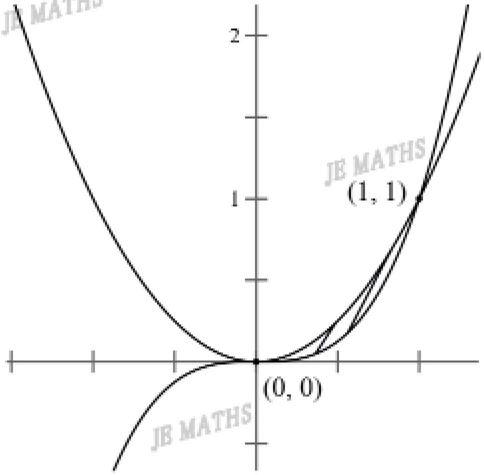
(ii)



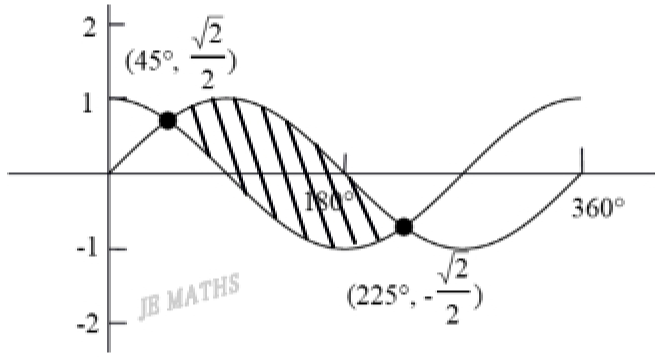
(b)



17. (a)



(b)



18. $A(0, a)$, $B(b, 0)$, $C(b/2, a/2)$

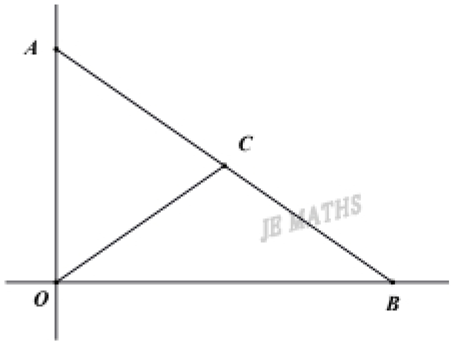
$d_{AC}=\sqrt{[(b/2)^2+(a/2-a)^2]}=\sqrt{(b^2/4+a^2/4)}=\sqrt{(a^2+b^2)}/2$

$d_{CO}=\sqrt{[(b/2)^2+(a/2)^2]}=\sqrt{(b^2/4+a^2/4)}=\sqrt{(a^2+b^2)}/2$

$d_{BC}=\sqrt{[(b-b/2)^2+(a/2)^2]}=\sqrt{(b^2/4+a^2/4)}=\sqrt{(a^2+b^2)}/2$

$d_{AC} = d_{CO} = d_{BC}$

ans: AC=CO=BC



19.

(a) (i)

$C(r, r)$, $m_{OC}=r/r=1$

l_{OC}: $y = x$

(ii)

Circle: $(x-r)^2+(y-r)^2= r^2$

(b) sub $y = x$ in to the circle

$(x-r)^2+(x-r)^2=r^2$

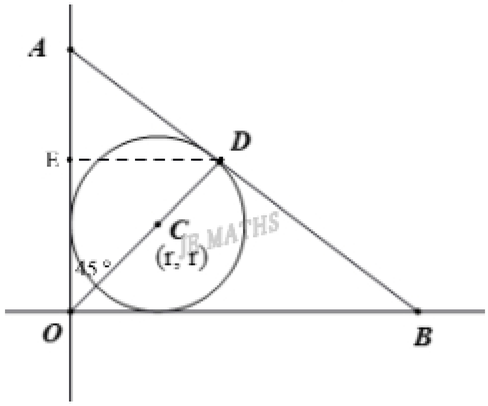
$2(x-r)^2=r^2$

$(x-r)^2=r^2/2$

$x-r= r/\sqrt{2}$ (omit -)

$x= r/\sqrt{2} + r = r(1/\sqrt{2}+1)$

$D(r(1/\sqrt{2}+1), r(1/\sqrt{2}+1))$



(c) l_{OC}: $y = x$,

$\tan\angle DOB=1$

$\angle DOB=45^\circ$

$\angle AOD = 90^\circ-\angle DOB$

$= 90^\circ-45^\circ$

$= 45^\circ$

AD = OD (equal angles opposite to equal sides)

OD⊥AB (tangent is perpendicular to the radius)

ans: ΔADO is an isosceles right angle triangle

(d) Make a height on OA from D, named E.

$D(r(1/\sqrt{2}+1), r(1/\sqrt{2}+1))$ (proved)

$DE = r(1/\sqrt{2}+1)$

$\angle AOD =\angle OAD = 45^\circ$ (equal angles opposite to equal sides)

$\angle ADE=90-45=45^\circ$, $\angle EDO =90-45= 45^\circ$ (angle sum of a triangle)

AE = ED = EO (equal angles opposite to equal sides)

$AO = 2ED$

$= 2\times r(1/\sqrt{2}+1)$

$= r(\sqrt{2}+2)$

ans: $A(r(\sqrt{2}+2), 0)$