Solutions pg 163 #1-7, 10, 13, 14, 19, 21, 22

I

(1) $\theta = 67^\circ \Rightarrow \theta_c = 90-67 = \boxed{23^\circ}$ $\theta_s = 180-67 = \boxed{113^\circ}$

(2). $7x+19+2x-1=180$ (they are supplementary)

$\Rightarrow 9x+18=180$ $\Rightarrow \angle 1 = 7x+19$ $\angle 2 = 2x-1$

$\Rightarrow 9x = 162$ $= 7(18)+19$ $= 2(18)-1$

$= 126+19$ $= 36-1$

$\Rightarrow x = 18$ $= \boxed{145^\circ}$ $= \boxed{35^\circ}$

check: $145+35=180$ ✓

(3) $-3x+5 + -8x+30 = 90$ (they are complementary)

$\Rightarrow -11x+35=90$ so $\angle 1 = -3x+5$ $\angle 2 = -8x+30$

$\Rightarrow -11x = 55$ $= -3(-5)+5$ $= -8(-5)+30$

$\Rightarrow x = -5$ $= 15+5$ $= 40+30$

$= \boxed{20^\circ}$ $= \boxed{70^\circ}$

check: $20+70=90$ ✓

(4) $4x-30 = 5x-70$ (they are vertical angles thus they equal)

$-4x+70 \quad -4x+70$

$\Rightarrow 40 = x$ $\Rightarrow$ so $\angle 1 = 4(40)-30$ $\angle 2 = 5x-70$

$= 160-30$ $= 5(40)-70$

$= \boxed{130^\circ}$ $= 200-70$

$= \boxed{130^\circ}$

check: they are equal ✓

(5) $10x-10 = 8x+14 \Rightarrow$ (they are alternate interiors, thus they equal)

$-8x+10 \quad -8x+10$

$\Rightarrow 2x = 24$ $\Rightarrow$ so $\angle 1 = 10x-10$ $\angle 2 = 8x+14$

$= 10(12)-10$ $= 8(12)+14$

$\Rightarrow x = 12$ $= 120-10$ $= 96+14$

$= \boxed{110^\circ}$ $= \boxed{110^\circ}$

Check: they are equal ✓

(6) $(2x+18)+(32-2x)+(20x+10)=180 \Rightarrow$ angle sum of a Δ equals $180°$

$\Rightarrow 2x+18+32-2x+20x+10=180$

$\Rightarrow 20x+60=180$

$\Rightarrow 20x=120$

$\Rightarrow x=\frac{120}{20}$

$=6$

so we have:

$\angle 1=2x+18 = 2(6)+18 = 12+18 = \boxed{30°}$

$\angle 2=32-2x = 32-2(6) = 32-12 = \boxed{20°}$

$\angle 3=20x+10 = 20(6)+10 = 120+10 = \boxed{130°}$

check: $30+20+130=180$ ✓

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(7) $12x+8x=12x+40 \Rightarrow$ (exterior angle equals the sum of the remote interior angles)

$\Rightarrow 20x=12x+40$

$\quad -12x \quad -12x$

$\Rightarrow 8x=40$

$\Rightarrow x=5$

so

$\angle 1=12x = 12(5) = \boxed{60°}$

$\angle 2=8x = 8(5) = \boxed{40°}$

$\angle 3=12x+40 = 12(5)+40 = 60+40 = \boxed{100°}$

check: $60+40=100$ ✓

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(10). Let β be the desired angle

(a) $\theta=390°$

$390-360=30°$

$\boxed{\beta=30°}$

(b). $\theta=-80°$

$-80+360=280°$

$\boxed{\beta=280°}$

(c) $\theta=810°$

$810-360=450$

$450-360=90°$

$\boxed{\beta=90°}$

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(13) The triangles are similar, hence the sides are in proportion:

$\underline{x}$: $\frac{25}{x}=\frac{20}{10}$

$\Rightarrow 20x=(10)(25)$

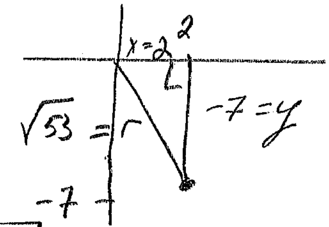
$\Rightarrow 20x=250 \Rightarrow \boxed{x=12.5}$

$\underline{y}$: $\frac{15}{y}=\frac{20}{10}$

$\Rightarrow 20y=(15)(10)$

$\Rightarrow 20y=150 \Rightarrow \boxed{y=7.5}$

(14). (2, -7)



$r = \sqrt{(2)^2+(-7)^2}$

$= \sqrt{4+49}$

$= \sqrt{53}$

⇒ $\sin(\theta) = \frac{y}{r} = \boxed{\frac{-7}{\sqrt{53}}}$ $\qquad \csc(\theta) = \frac{r}{y} = \boxed{\frac{\sqrt{53}}{-7}}$

$\cos(\theta) = \frac{x}{r} = \boxed{\frac{2}{\sqrt{53}}}$ $\qquad \sec(\theta) = \frac{r}{x} = \boxed{\frac{\sqrt{53}}{2}}$

$\tan(\theta) = \frac{y}{x} = \boxed{\frac{-7}{2}}$ $\qquad \cot(\theta) = \frac{x}{y} = \boxed{\frac{2}{-7}}$

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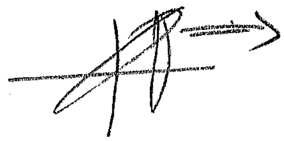
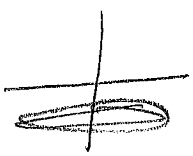
(19) (a)



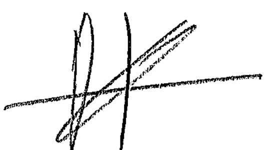
$\left.\begin{array}{l} \cos(\theta) > 0 \Rightarrow QI \text{ or } QIIII \\ \tan(\theta) > 0 \Rightarrow QI \text{ or } QIII \end{array}\right\} \Rightarrow \boxed{\theta \text{ in } \theta I}$

(b).



$\left.\begin{array}{l} \sin(\theta) < 0 \Rightarrow QIII \text{ or } QIIII \\ \csc(\theta) < 0 \Rightarrow QIII \text{ or } QIIII \end{array}\right\} \Rightarrow \boxed{\text{Either } QIII \text{ or } QIIII}$

(c).



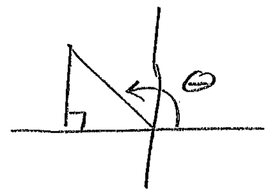
$\left.\begin{array}{l} \cot(\theta) > 0 \Rightarrow QI \text{ or } QIII \\ \cos(\theta) < 0 \rightarrow QII \text{ or } QIII \end{array}\right\} \Rightarrow \boxed{QIII}$

(21) given $\cos(\theta) = -\frac{7}{12}$

$\Rightarrow \sec(\theta) = \boxed{-\frac{12}{7}}$ (Reciprocal)

(22) given $\sin(\theta) = \frac{3}{7}$ $\Rightarrow$

θ in QII



$\sin(\theta) = \frac{y}{r} = \frac{3}{7} \Rightarrow \begin{matrix} y=3 \\ r=7 \end{matrix} \Rightarrow x^2+y^2=r^2$

$\Rightarrow x^2+(3)^2=(7)^2$

$\Rightarrow x^2+9=49$

$\Rightarrow x^2=40$

$\Rightarrow x = \pm\sqrt{40} \Rightarrow$ choose $x = -\sqrt{40}$

$\hookrightarrow$ QII

so we have

$x = -\sqrt{40}$

$y = 3$

$r = 7$

so

$$\boxed{\begin{matrix} \sin(\theta) = \frac{y}{r} = \frac{3}{7} & \csc(\theta) = \frac{7}{3} \\ \cos(\theta) = \frac{x}{r} = \frac{-\sqrt{40}}{7} & \sec(\theta) = -\frac{7}{\sqrt{40}} \\ \tan(\theta) = \frac{y}{x} = \frac{3}{7} & \cot(\theta) = \frac{7}{3} \end{matrix}}$$