

$$\cos \theta = \frac{12}{13}, \tan \theta = -\frac{5}{12} \quad \text{g) } \sin \theta = -\frac{5}{13},$$

$$\cos \theta = -\frac{12}{13}, \tan \theta = \frac{5}{12} \quad \text{h) } \sin \theta = \frac{5}{13},$$

$$\cos \theta = -\frac{12}{13}, \tan \theta = -\frac{5}{12} \quad \text{2.a) } \csc \alpha = \frac{5}{3},$$

$$\sec \alpha = \frac{5}{4}, \cot \alpha = \frac{4}{3} \quad \text{b) } \csc \theta = -\frac{13}{5}, \sec \theta = -\frac{13}{12},$$

$$\cot \theta = \frac{12}{5} \quad \text{c) } \csc \theta = \frac{25}{24}, \sec \theta = -\frac{25}{7}, \cot \theta = -\frac{7}{24}$$

$$\text{d) } \csc \theta = -\frac{25}{24}, \sec \theta = \frac{25}{7}, \cot \theta = -\frac{7}{24} \quad \text{3.a) } \frac{7}{\sqrt{53}}$$

$$\text{b) } \frac{2}{\sqrt{53}} \quad \text{c) } \frac{7}{2} \quad \text{4.a) } \csc \alpha = \frac{\sqrt{202}}{11} \quad \text{b) } \sec \alpha = -\frac{\sqrt{202}}{9}$$

$$\text{c) } \cot \alpha = -\frac{9}{11} \quad \text{5.b) } \sin \theta = \frac{\sqrt{7}}{4}, \tan \theta = -\frac{\sqrt{7}}{3}$$

$$\text{6.a) } \csc \theta = -\frac{5}{3}, \sec \theta = -\frac{5}{4}, \cot \theta = \frac{4}{3}$$

$$\text{b) } \sin \alpha = \frac{-\sqrt{161}}{15}, \tan \alpha = \frac{-\sqrt{161}}{8} \quad \text{7.a) } \sin \theta = \frac{2}{\sqrt{5}},$$

$$\sec \theta = \sqrt{5} \quad \text{b) } \cos \beta = -\frac{\sqrt{65}}{\sqrt{114}}, \csc \beta = \frac{\sqrt{114}}{7}$$

$$\text{8.a) } \sin \theta = -\frac{5}{13}, \cos \theta = -\frac{12}{13}, \tan \theta = \frac{5}{12},$$

$$\csc \theta = -\frac{13}{5}, \cot \theta = \frac{12}{5} \quad \text{b) } \cos \alpha = \frac{24}{25}, \tan \alpha = \frac{7}{24},$$

$$\csc \alpha = \frac{25}{7}, \sec \alpha = \frac{25}{24}, \cot \alpha = \frac{24}{7} \quad \text{c) } \sin \theta = -\frac{17}{8},$$

$$\cos \theta = \frac{15}{17}, \tan \theta = -\frac{8}{15}, \sec \theta = \frac{17}{15}, \cot \theta = -\frac{15}{8}$$

$$\text{9.a) (i) } \pm 4 \quad \text{(ii) } \pm 6 \quad \text{(iii) } \pm 2 \quad \text{b) (i) } \sin \theta = \pm \frac{4}{5}, \cos \theta = \frac{3}{5},$$

$$\tan \theta = \pm \frac{4}{3} \quad \text{(ii) } \sin \theta = \frac{4}{5}, \cos \theta = \pm \frac{3}{5}, \tan \theta = \pm \frac{4}{3}$$

$$\text{(iii) } \sin \theta = \pm \frac{2}{\sqrt{13}}, \cos \theta = \frac{3}{\sqrt{13}}, \tan \theta = \pm \frac{2}{3} \quad \text{10.1} \quad \text{11.} \quad \frac{6}{17}$$

4.2 Exercise, page 147

$$\text{2.a) } \sin \theta = \frac{24}{25}, \cos \theta = \frac{7}{25}, \tan \theta = \frac{24}{7} \quad \text{b) } \sin \theta = \frac{4}{5},$$

$$\cos \theta = -\frac{3}{5}, \tan \theta = -\frac{4}{3} \quad \text{c) } \sin \theta = -\frac{12}{13}, \cos \theta = -\frac{5}{13},$$

$$\tan \theta = \frac{12}{5} \quad \text{d) } \sin \theta = -\frac{3}{5}, \cos \theta = \frac{4}{5}, \tan \theta = -\frac{3}{4}$$

$$\text{3.a) } \csc \theta = \frac{\sqrt{34}}{5}, \sec \theta = -\frac{\sqrt{34}}{3}, \cot \theta = -\frac{3}{5} \quad \text{b) } \csc \theta = -\frac{\sqrt{13}}{3},$$

$$\sec \theta = -\frac{\sqrt{13}}{2}, \cot \theta = \frac{2}{3} \quad \text{c) } \csc \theta = -\frac{\sqrt{13}}{2},$$

$$\sec \theta = -\frac{\sqrt{13}}{3}, \cot \theta = \frac{3}{2} \quad \text{d) } \csc \theta = -\frac{\sqrt{34}}{3}, \sec \theta = \frac{\sqrt{34}}{5},$$

$$\cot \theta = -\frac{5}{3} \quad \text{4.a) } (-\sqrt{3}, -1) \quad \text{b) } \sin \alpha = -\frac{1}{2}, \tan \alpha = \frac{1}{\sqrt{3}}$$

$$\text{5.a) } (-8, 15) \quad \text{b) } \cos \theta = -\frac{8}{17}, \sec \theta = -\frac{17}{8},$$

$$\cot \theta = -\frac{8}{15} \quad \text{6.a) } \text{2nd, 3rd} \quad \text{c) } \sin \theta = \pm \frac{24}{25} \quad \text{7.a) } \text{1st,}$$

$$\text{2nd} \quad \text{c) } \cos \beta = \pm \frac{3}{5}, \tan \beta = \pm \frac{4}{3} \quad \text{8.a) } \text{2nd, 4th}$$

$$\text{c) } \sin \alpha = \pm \frac{7}{25}, \cos \alpha = \pm \frac{24}{25} \quad \text{9.a) } \cos \theta = \pm \frac{15}{17}$$

$$\text{b) } \sin \alpha = \pm \frac{5}{13} \quad \text{c) } \tan \beta = \pm \frac{24}{7} \quad \text{d) } \cot \theta = \pm \sqrt{3}$$

$$\text{10.a) } \sin \theta = \pm \frac{24}{25} \quad \text{b) } \pm \frac{168}{625} \quad \text{c) } \pm 1 \quad \text{12.c) } \frac{\sin \theta}{\cos \theta} = \tan \theta$$

$$\text{13.a) } + \quad \text{b) } - \quad \text{c) } - \quad \text{d) } + \quad \text{e) } - \quad \text{f) } - \quad \text{14.a) } - \quad \text{b) } + \quad \text{c) } -$$

$$\text{d) } - \quad \text{e) } + \quad \text{f) } - \quad \text{15.a) } - \quad \text{b) } + \quad \text{c) } + \quad \text{d) } - \quad \text{e) } - \quad \text{f) } - \quad \text{16.a) } \text{I}$$

$$\text{b) } \text{III} \quad \text{c) } \text{II} \quad \text{d) } \text{IV} \quad \text{e) } \text{II} \quad \text{f) } \text{I} \quad \text{17.a) } \text{I, II} \quad \text{b) } \text{II, III} \quad \text{c) } \text{I, III} \quad \text{d) } \text{III}$$

$$\text{IV} \quad \text{e) } \text{I, III} \quad \text{f) } \text{I, IV} \quad \text{18.a) } \text{I}+, \text{II}+, \text{III}-, \text{IV}- \quad \text{b) } \text{I}+, \text{II}-,$$

$$\text{III}-, \text{IV}+ \quad \text{c) } \text{I}+, \text{II}-, \text{III}+, \text{IV}- \quad \text{d) } \text{I}+, \text{II}+, \text{III}-, \text{IV}$$

$$\text{e) } \text{I}+, \text{II}-, \text{III}-, \text{IV}+ \quad \text{f) } \text{I}+, \text{II}-, \text{III}+, \text{IV}-$$

4.3 Exercise, page 151

$$\text{1.a) } 480^\circ \quad \text{b) } -405^\circ \quad \text{c) } 390^\circ \quad \text{d) } -480^\circ \quad \text{2.a) } 585^\circ,$$

$$945^\circ, -135^\circ, \dots \quad \text{b) } 225^\circ \quad \text{3.a) } -30^\circ, -390^\circ, \text{b) } 330^\circ$$

$$\text{4.a) } -315^\circ, -675^\circ \quad \text{b) } -240^\circ, -600^\circ \quad \text{c) } -340^\circ,$$

$$-700^\circ \quad \text{5.a) } 315^\circ, 675^\circ \quad \text{b) } 240^\circ, 600^\circ \quad \text{c) } 300^\circ, 660^\circ$$

$$\text{6.b) } -290^\circ \quad \text{c) } 70^\circ \quad \text{d) } 70^\circ \quad \text{7.b) } 210^\circ \quad \text{8.a) } 160^\circ \quad \text{b) } 135^\circ$$

$$\text{c) } 330^\circ \quad \text{d) } 300^\circ \quad \text{e) } 60^\circ \quad \text{f) } 240^\circ \quad \text{9.a) } 30^\circ \quad \text{b) } 45^\circ \quad \text{c) } 55^\circ$$

$$\text{d) } 255^\circ \quad \text{e) } 240^\circ \quad \text{f) } 60^\circ \quad \text{g) } 10^\circ \quad \text{h) } 20^\circ \quad \text{i) } 220^\circ \quad \text{j) } 260^\circ$$

$$\text{10. (c), (d) } \quad \text{11. (a), (c), (d) } \quad \text{12. (a), (b), (c) } \quad \text{13. (b), (c), (d)}$$

4.4 Exercise, page 155

$$\text{1. } \sin: \frac{1}{2}, \frac{1}{\sqrt{2}}, \frac{\sqrt{3}}{2}; \quad \cos: \frac{\sqrt{3}}{2}, \frac{1}{\sqrt{2}}, \frac{1}{2}; \quad \tan: \frac{1}{\sqrt{3}}, 1, \sqrt{3}$$

$$\text{2.a) } \frac{1}{\sqrt{2}} \quad \text{b) } \frac{1}{2} \quad \text{c) } \frac{\sqrt{3}}{2} \quad \text{d) } \frac{\sqrt{3}}{2} \quad \text{e) } \sqrt{2} \quad \text{f) } \sqrt{3} \quad \text{g) } \frac{1}{\sqrt{3}} \quad \text{h) } \frac{2}{\sqrt{3}}$$

$$\text{i) } 1 \quad \text{j) } \frac{2}{\sqrt{3}} \quad \text{k) } \sqrt{2} \quad \text{l) } \frac{1}{\sqrt{3}} \quad \text{3.a) } \sin \theta = \frac{1}{\sqrt{2}}, \cos \theta = -\frac{1}{\sqrt{2}},$$

$$\tan \theta = -1, \csc \theta = \sqrt{2}, \sec \theta = -\sqrt{2}, \cot \theta = -1$$

$$\text{b) } \sin \theta = -\frac{1}{2}, \cos \theta = -\frac{\sqrt{3}}{2}, \tan \theta = \frac{1}{\sqrt{3}}, \csc \theta = -2,$$

$$\sec \theta = -\frac{2}{\sqrt{3}}, \cot \theta = \sqrt{3} \quad \text{4.a) } \sin \theta = -\frac{1}{\sqrt{2}}, \cos \theta = -\frac{1}{\sqrt{2}},$$

$$\tan \theta = 1 \quad \text{b) } \sin \theta = \frac{\sqrt{3}}{2}, \cos \theta = \frac{1}{2}, \tan \theta = \sqrt{3}$$

$$\text{c) } \sin \theta = -\frac{1}{2}, \cos \theta = \frac{\sqrt{3}}{2}, \tan \theta = -\frac{1}{\sqrt{3}} \quad \text{d) } \sin \theta = \frac{\sqrt{3}}{2},$$

$$\cos \theta = -\frac{1}{2}, \tan \theta = -\sqrt{3} \quad \text{5.b) } \sin 300^\circ = -\frac{\sqrt{3}}{2},$$

$$\cos 300^\circ = \frac{1}{2}, \tan 300^\circ = -\sqrt{3} \quad \text{6.b) } \csc (-225^\circ) = \sqrt{2},$$

$$\sec (-225^\circ) = -\sqrt{2}, \cot (-225^\circ) = -1 \quad \text{7.a) } -\frac{\sqrt{3}}{2}$$

$$\text{b) } -\frac{\sqrt{3}}{2} \quad \text{c) } \text{Answers same because the angles are coterminal.}$$