For each of the following functions, identify the domain and range of the "primary" phase and the period.

	Domain	Range	Period
1. sine	$[0, 2\pi]$	$[-1, 1]$	2π
2. cosine	$[0, 2\pi]$	$[-1, 1]$	2π
3. cosecant	$(0, \pi) \cup (\pi, 2\pi)$	$(-\infty, -1] \cup [1, \infty)$	2π
4. secant	$[0, \pi/2) \cup (\pi/2, 3\pi/2) \cup (3\pi/2, 2\pi]$	$(-\infty, -1] \cup [1, \infty)$	2π
5. tangent	$(-\pi/2, \pi/2)$	$(-\infty, \infty)$	π
6. cotangent	$(0, \pi)$	$(-\infty, \infty)$	π

Fill in the blank.

7. To graph a secant or cosecant, you would first graph it's ___reciprocal___ function.
   (Hint: It's a word that starts with the letter "r".)

8. The reciprocal of secant is ___Cosine___.

9. The reciprocal of cosecant is ___Sine___.

10. Secant, cosecant, tangent, and cotangent all have undefined values that are represented by
    a(an) ___asymptote___ on the graph.

For each of the following functions, identify the period, domain, range, and asymptotes. Graph.

11. $y = 3\csc\left(2x - \dfrac{\pi}{6}\right)$

12. $y = \dfrac{1}{2}\sec\left(\dfrac{x}{3} + \dfrac{\pi}{4}\right)$

13. $y = 3\tan\left(2\theta - 40°\right)$

14. $y = \cot\left(\dfrac{x}{2} - \pi\right)$

Graph one phase of each function.

15. $y = 2\cot\left(3\theta - 90°\right) - 2$

16. $y = -\csc\left(\dfrac{x}{3}\right)$

17. $y = 2\sec\left(\dfrac{x}{2} - \dfrac{\pi}{4}\right)$

18. $y = -3\tan\left(4x - \pi\right)$

11. $y = 3\csc\left(2x - \frac{\pi}{6}\right)$

$\boxed{\text{Sin}}$

$2x - \frac{\pi}{6} = 0 \qquad 2x - \frac{\pi}{6} = 2\pi$

$2x = \frac{\pi}{6} \qquad\quad 2x = \frac{13\pi}{6}$

$x = \frac{\pi}{12} \qquad\quad x = \frac{13\pi}{12}$
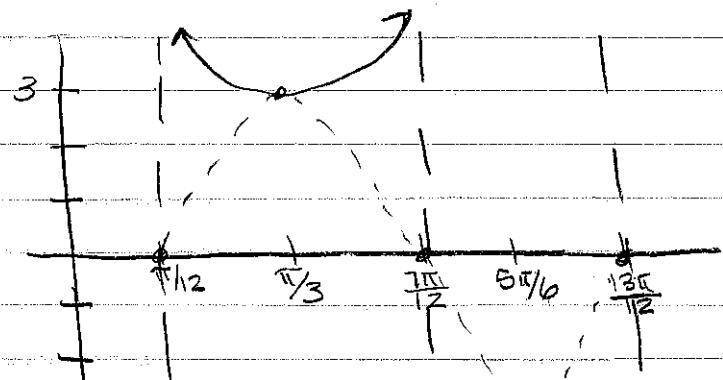
Period $= \pi$

$D: \left(\frac{\pi}{12}, \frac{7\pi}{12}\right) \cup \left(\frac{7\pi}{12}, \frac{13\pi}{12}\right)$

$R: (-\infty, -3] \cup [3, \infty)$

$A: \frac{\pi}{12}, \frac{7\pi}{12}, \frac{13\pi}{12}$

12. $y = \frac{1}{2}\sec\left(\frac{x}{3} + \frac{\pi}{4}\right)$

$\boxed{\text{Cos}}$

$\frac{x}{3} + \frac{\pi}{4} = 0 \qquad \frac{x}{3} + \frac{\pi}{4} = 2\pi$

$\frac{x}{3} = -\frac{\pi}{4} \qquad\quad \frac{x}{3} = \frac{7\pi}{4}$

$x = -\frac{3\pi}{4} \qquad\quad x = \frac{21\pi}{4}$
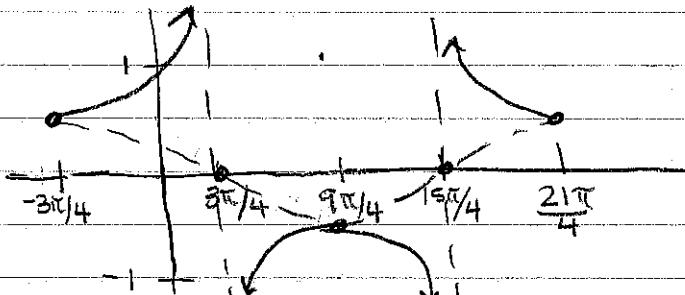
Period $= 6\pi$

$D: \left[\frac{-3\pi}{4}, \frac{3\pi}{4}\right) \cup \left(\frac{3\pi}{4}, \frac{15\pi}{4}\right) \cup \left(\frac{15\pi}{4}, \frac{21\pi}{4}\right]$

$R: (-\infty, -\frac{1}{2}] \cup [\frac{1}{2}, \infty)$

$A: \frac{3\pi}{4}, \frac{15\pi}{4}$

13. $y = 3\tan(2\theta - 40°)$

$2\theta - 40° = -90 \qquad 2\theta - 40 = 90°$

$2\theta = -50° \qquad\qquad 2\theta = 130°$

$\theta = -25° \qquad\qquad\;\; \theta = 65°$
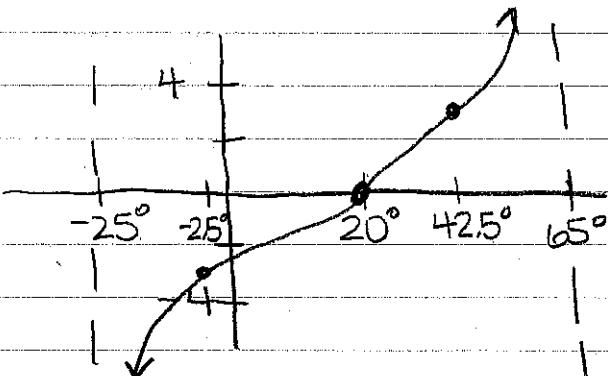
Period $= 90°$

$D: (-25°, 65°)$

$R: (-\infty, \infty)$

$A: -25°, 65°$

14. $y = \cot\left(\dfrac{x}{2} - \pi\right)$

$\dfrac{x}{2} - \pi = 0 \qquad \dfrac{x}{2} - \pi = \pi$

$\dfrac{x}{2} = \pi \qquad\quad \dfrac{x}{2} = 2\pi$

$x = 2\pi \qquad\quad x = 4\pi$
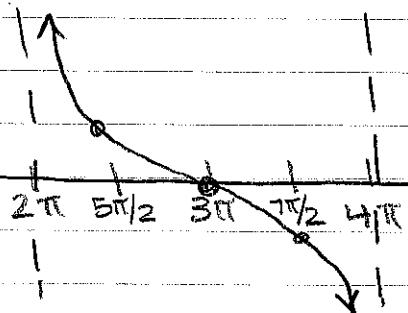
Period $= 2\pi$
D: $(2\pi, 4\pi)$
R: $(-\infty, \infty)$
A: $2\pi, 4\pi$

15. $y = 2\cot(3\theta - 90°) - 2$

$3\theta - 90° = 0° \qquad 3\theta - 90° = 180°$

$3\theta = 90° \qquad\quad 3\theta = 270°$

$\theta = 30° \qquad\quad \theta = 90°$
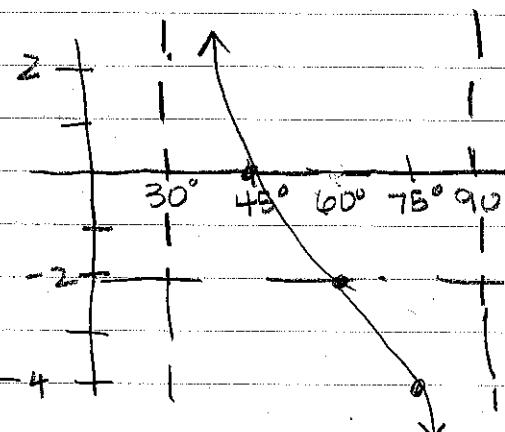
Period $= 60°$
D: $(30°, 90°)$
R: $(-\infty, \infty)$
A: $30°, 90°$

16. $y = -\csc\left(\frac{x}{3}\right)$

$\boxed{\sin}$

$\frac{x}{3} = 0 \qquad \frac{x}{3} = 2\pi$

$x = 0 \qquad x = 6\pi$
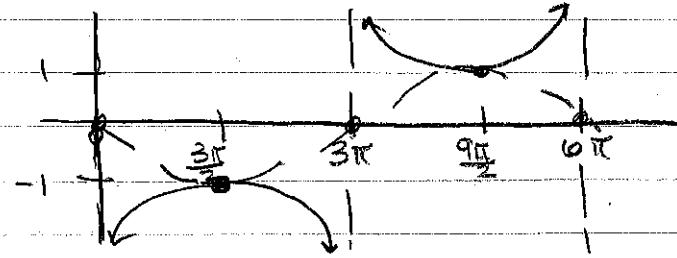
Reflect x-axis!

Period $= 6\pi$

D: $(0, 3\pi) \cup (3\pi, 6\pi)$

R: $(-\infty, -1] \cup [1, \infty)$

A: $0, 3\pi, 6\pi$

17. $y = 2\sec\left(\frac{x}{2} - \frac{\pi}{4}\right)$

$\boxed{\cos}$

$\frac{x}{2} - \frac{\pi}{4} = 0 \qquad \frac{x}{2} - \frac{\pi}{4} = 2\pi$

$\frac{x}{2} = \frac{\pi}{4} \qquad \frac{x}{2} = \frac{9\pi}{4}$

$x = \frac{\pi}{2} \qquad x = \frac{9\pi}{2}$
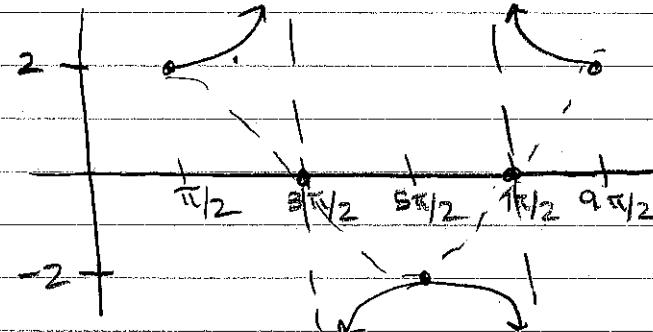
Period $= 4\pi$

D: $[\pi/2, 3\pi/2) \cup (3\pi/2, 7\pi/2) \cup (7\pi/2, 9\pi/2]$

R: $(-\infty, -2] \cup [2, \infty)$

A: $\frac{3\pi}{2}, \frac{7\pi}{2}$

18. $y = -3\tan(4x - \pi)$

$4x - \pi = -\frac{\pi}{2} \qquad 4x - \pi = \frac{\pi}{2}$

$4x = \frac{\pi}{2} \qquad 4x = \frac{3\pi}{2}$

$x = \frac{\pi}{8} \qquad x = \frac{3\pi}{8}$
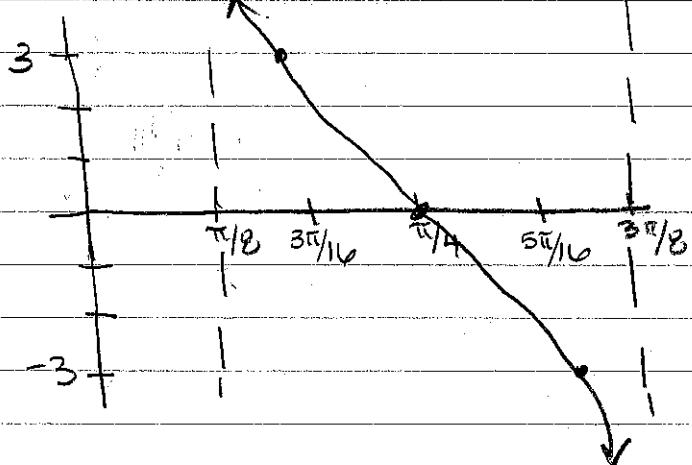
Reflect x-axis!

Period $= \pi/4$

D: $(\pi/8, 3\pi/8)$

R: $(-\infty, \infty)$

A: $\frac{\pi}{8}, \frac{3\pi}{8}$