1.5 hw, p. 88, 13-20, 25-38

To find vertical asymptotes, you are looking for all values of *x* that make only the denominator zero.

13. $x = 0$
14. $x = 3$
15. $x = 2$ and -2
16. None (b/c $x^2 + 9 \neq 0$)
17. None
18. $s = 4$ and -4
19. The denominator factors: $(x+2)(x-1)$, x = -2 and 1
20. None. When $x = 2$, the denominator AND numerator equal zero. There would be a hole at $x = 2$, not an asymptote.

25. $\csc(\pi x) = \dfrac{1}{\sin(\pi x)}$, $\sin(\pi x) = 0$ when x = 0, 1, 2, etc (or any integer)
26. $\tan(\pi x) = \dfrac{\sin(\pi x)}{\cos(\pi x)}$, $\cos(\pi x) = 0$ when x = 0.5, 1.5, 2.5, etc
27. $\sin t = 0$ when $x = 0, \pi, 2\pi, 3\pi$, etc . But, when x = 0, the numerator is 0 too. So the answer would *x* equals all multiples of *pi* other than 0.
28. There is a hole $\theta = 0$ because $\dfrac{\tan 0}{0} = \dfrac{0}{0}$. Since tangent is in the numerator, tangent has asymptotes at $\dfrac{\pi}{2}$, $\dfrac{3\pi}{2}$, etc $\left(\text{or } \dfrac{\pi}{2} \pm \pi n \right)$

29. Removable (-1 makes both denominator and numerator zero)
30. Non-removable (-1 makes only the denominator zero)
31. Non-removable (-1 makes only the denominator zero)
32. Removable (-1 makes both denominator and numerator zero)

33. ∞
34. $-\infty$
35. ∞
36. $\dfrac{4}{8} = 0.5$
37. $\dfrac{x+3}{(x+3)(x-2)} = \dfrac{1}{x-2}$, then plug -3 in , answer: -0.2

38. Plugging in -0.5 doesn't work, so try to factor first. $\dfrac{(3x-1)(2x+1)}{(2x+1)(2x-3)}$. Since $2x+1$ is a common factor, there is a hole there. So cross them off and plug -0.5 into what's left. $\dfrac{(3x-1)\cancel{(2x+1)}}{\cancel{(2x+1)}(2x-3)} = \dfrac{-2.5}{-4} = \dfrac{5}{8}$ or 0.625