1. This is periodic. To find the fundamental period, we need to solve $5x = 2\pi$ for $x$. We get $x = \frac{2\pi}{5}$, and this is the fundamental period.

2. This is periodic with fundamental period $\frac{2\pi}{2\pi} = 1$.

3. This is not periodic.

4. This is periodic with fundamental period $\frac{2\pi}{\pi/L} = 2L$.

5. This is periodic with fundamental period $\frac{\pi}{\pi} = 1$. (The fundamental period of $\tan x$ is $\pi$, not $2\pi$.)

6. This is not periodic.

7. This is periodic; its fundamental period is 2. (Consider its graph.)

8. This is periodic with period 4; again, consider its graph.

12. I will let you do this. You may thank me later.

13. The graph is below. For (b): Since this is an odd function, $a_n = 0$ for all $n$. We must determine $b_n = \frac{1}{L} \int_{-L}^{L} (-x) \sin \frac{n\pi x}{L} dx$, with $L = 1$. A quick integration by MAPLE gives $b_n = \frac{2(-1)^n}{n\pi}$. (Recall that $\cos n\pi = (-1)^n$ for $n$ an integer.) Thus, the series is $f(x) = \sum_{n=1}^{\infty} \frac{2(-1)^n}{n\pi} \sin n\pi x$.

15. This function is neither odd nor even, so we need to calculate $a_n$ and $b_n$. I’ll ask MAPLE! We have $L = \pi$. Thus $a_n = \frac{1}{\pi} \int_{-\pi}^{0} x \cos nxdx = \frac{(-1)^{n+1} + 1}{\pi n^2}$ and $b_n = \frac{1}{\pi} \int_{-\pi}^{0} x \sin nxdx = \frac{(-1)^{n+1}}{n}$. Also, $a_0 = -\pi/2$. Now

$$f(x) = -\frac{\pi}{4} + \sum_{m=1}^{\infty} \left( \frac{(-1)^{m+1} + 1}{\pi m^2} \cos mx + \frac{(-1)^{m+1}}{m} \sin mx \right).$$
18. This function has odd symmetry, so we only need to compute the $b_n$. We have $b_n = \frac{1}{2} \int_{-1}^{1} x \sin \frac{m\pi x}{4} = \frac{2}{\pi^2 n^2} (2\sin(n/2) - n\cos(n/2))$. The series is therefore

$$f(x) = \sum_{m=1}^{\infty} \frac{2}{\pi^2 m^2} (2\sin(m/2) - m\cos(m/2)) \sin \frac{m\pi x}{4}.$$  

The coefficients can be simplified since the sine terms are zero for even $n$ and the cosine terms are zero for odd $n$, but I will let MAPLE do the work.

19. $f$ is odd, so we need only consider the $b_n$. We have $b_m = \frac{1}{2} \int_{-2}^{2} f(x) \sin \frac{m\pi x}{2} = \frac{2((-1)^{m+1} + 1)}{m\pi}$. The series is therefore

$$f(x) = \sum_{m=1}^{\infty} \frac{2((-1)^{m+1} + 1)}{m\pi} \sin \frac{m\pi x}{2}.$$  

20. Again, $f$ is odd. We have $b_m = \int_{-1}^{1} x \sin m\pi x = \frac{2(-1)^{m+1}}{m\pi}$, giving

$$y(x) = \sum_{m=1}^{\infty} \frac{2(-1)^{m+1}}{m\pi} \sin m\pi x.$$  