Definition of the Derivative of a Function

$$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h} \quad f'(c)=\lim_{x\to c}\frac{f(x)-f(c)}{x-c} \quad f'(x)\approx\lim_{h\to 0}\frac{f(x+h)-f(x-h)}{2h}$$

For each definition of the derivative below, determine which function we are taking the derivative of and if necessary what x value are we taking the derivative at.

1. $\lim_{h\to 0}\frac{(x+h)^3-x^3}{h}$

2. $\lim_{h\to 0}\frac{\sin(\pi+h)-\sin(\pi)}{h}$

3. $\lim_{x\to e}\frac{x^2-e^2}{x-e}$

4. $\lim_{h\to 0}\frac{\tan\left(\frac{1}{4}\pi+h\right)-\tan\left(\frac{1}{4}\pi-h\right)}{2h}$

5. $\lim_{h\to 0}\frac{\sqrt{x+h}-\sqrt{x}}{h}$

6. $\lim_{h\to 0}\frac{1}{2h}\left[\frac{x+h}{x+h-9}-\frac{x-h}{x-h-9}\right]$

7. $\lim_{h\to 0}\frac{3-(1+h)^2-2}{h}$

8. $\lim_{x\to 2}\frac{\frac{1}{x}-\frac{1}{2}}{x-2}$

9. $\lim_{h\to 0}\frac{(1+h)^2+4-5}{h}$