1. Evaluate the following limits:

(a)

$$\begin{aligned}\lim_{x\to 3}\frac{x^2-6x+9}{x^2-5x+6} &= \lim_{x\to 3}\frac{(x-3)(x-3)}{(x-2)(x-3)}\\ &= \lim_{x\to 3}\frac{x-3}{x-2} = \frac{3-3}{3-2} = 0.\end{aligned}$$

(b)

$$\begin{aligned}\lim_{x\to 0}\frac{\tan(7x)}{x} &= \lim_{x\to 0}\frac{\sin(7x)}{x\cos(7x)}\\ &= \lim_{x\to 0}\frac{\sin(7x)}{7x}\cdot\frac{7}{\cos(7x)}\\ &= \lim_{x\to 0}\frac{\sin(7x)}{7x}\cdot\lim_{x\to 0}\frac{7}{\cos(7x)}\\ &= (1)\frac{7}{1} = 7.\end{aligned}$$

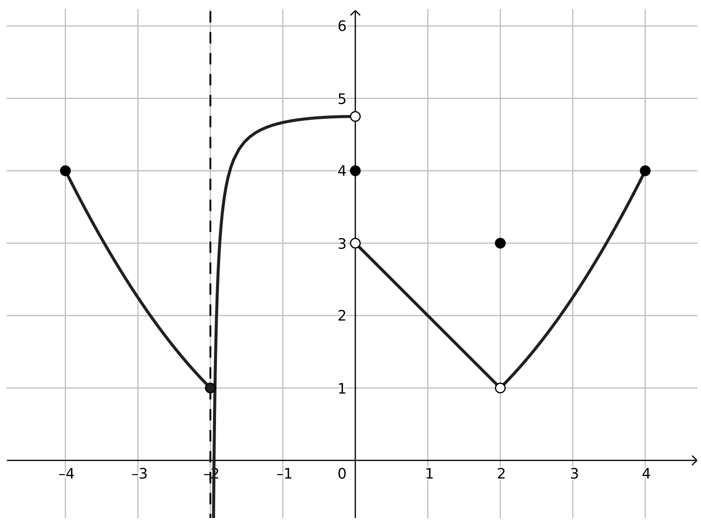
(c)

$$\begin{aligned}\lim_{x\to 1}\frac{\sqrt{x}-1}{x^2-1} &= \lim_{x\to 1}\frac{\sqrt{x}-1}{(x-1)(x+1)}\cdot\frac{\sqrt{x}+1}{\sqrt{x}+1}\\ &= \lim_{x\to 1}\frac{x-1}{(x-1)(x+1)(\sqrt{x}+1)}\\ &= \lim_{x\to 1}\frac{1}{(x+1)(\sqrt{x}+1)}\\ &= \frac{1}{(1+1)(1+1)} = \frac{1}{4}.\end{aligned}$$

Alternative solution: factor the $x-1$ in the denominator as $(x-1) = (\sqrt{x}-1)(\sqrt{x}+1)$.

$$\begin{aligned}\lim_{x\to 1}\frac{\sqrt{x}-1}{x^2-1} &= \lim_{x\to 1}\frac{\sqrt{x}-1}{(\sqrt{x}-1)(\sqrt{x}+1)(x+1)}\\ &= \lim_{x\to 0}\frac{1}{(\sqrt{x+1})(x+1)} = \frac{1}{4}.\end{aligned}$$

2. The graph of a function f is given below:



Determine the following values (write DNE if something does not exist):

(a) The domain of f: $[-4, 4]$

(b) $\lim_{x\to -2^-} f(x)$: 1

(c) $\lim_{x\to -2^+} f(x)$: $-\infty$

(d) $\lim_{x\to -2} f(x)$: Does not exist

(e) $f(-2)$: 1

(f) $\lim_{x\to 2^-} f(x)$: 1

(g) $\lim_{x\to 2^+} f(x)$: 1

(h) $\lim_{x\to 2} f(x)$: 1

(i) $f(2)$: 3