Reminder: Basic Functions

* Power function (eg. $f(x) = x^5$)
* Root function (eg. $f(x) = \sqrt{x}$)
* Polynomial (eg. $f(x) = 2 + 3x + 4x^2$)
* Rational function (e.g. $f(x) = \frac{1+x}{x^2+1}$)
* Algebraic function (eg. $f(x) = \frac{\sqrt{2x+1}}{\sqrt[3]{x} + 1}$)
* Trigonometric function (eg. $f(x) = \tan x - \cos x$)
* Exponential function (eg. $f(x) = \pi^x$)
* Logarithmic function (eg. $f(x) = \log_2 x$)

You should be able to recognize these functions and their graphs

Sect 2.2 # 9

(a) $\lim_{x \to -7} f(x) = -\infty$

(b) $\lim_{x \to -3} f(x) = \infty$

(c) $\lim_{x \to 0} f(x) = \infty$

(d) $\lim_{x \to 6^-} f(x) = -\infty$

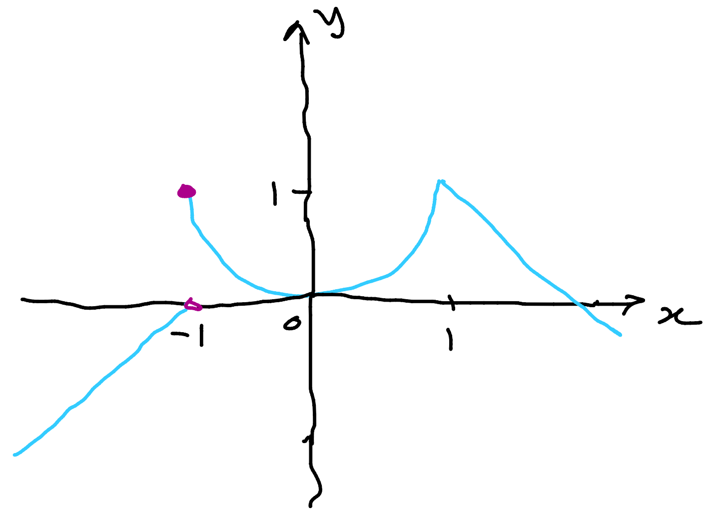
(e) $\lim_{x \to 6^+} f(x) = \infty$

(f) Equations of vertical asymptotes are

$x = -7, \ x = -3, \ x = 0, \ x = 6$

Sect 2.2 # 11

$$f(x) = \begin{cases} 1+x & \text{if } x < -1 \\ x^2 & \text{if } -1 \le x < 1 \\ 2-x & \text{if } x \ge 1 \end{cases}$$



$\lim_{x \to a} f(x)$ exists everywhere on $\mathbb{R}$ except at

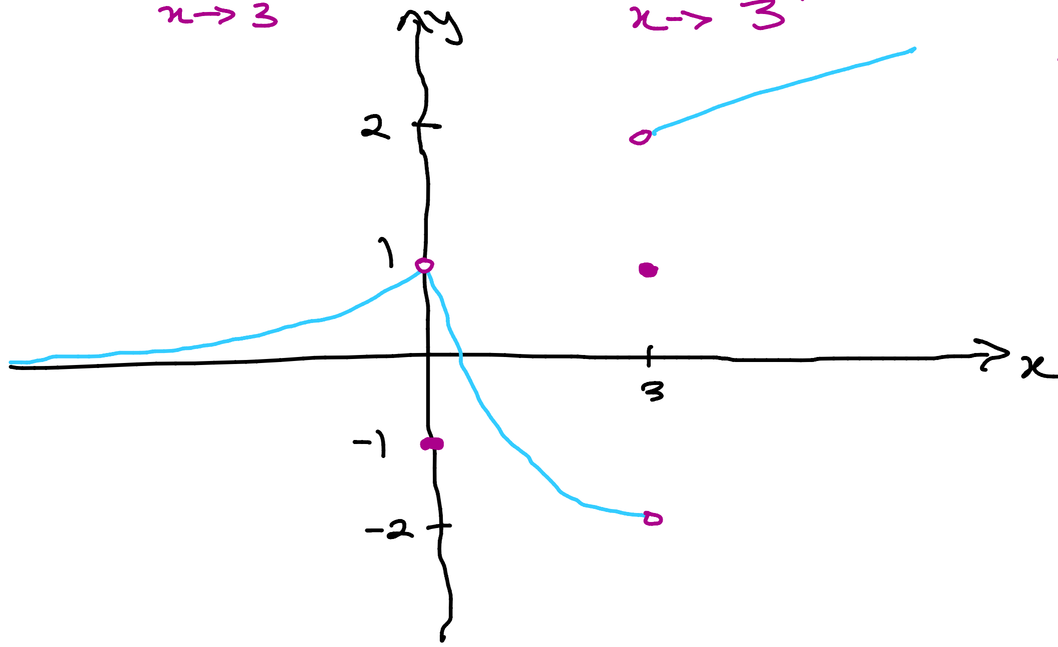
$a = -1$

where

$\lim_{x \to a^-} f(x) = 0$ and $\lim_{x \to a^+} f(x) = 1$

$\lim_{x \to 0} f(x) = 1$, $\lim_{x \to 3^-} f(x) = -2$, $\lim_{x \to 3^+} f(x) = 2$, $f(0) = -1$

$f(3) = 1$



(17) Repeat similarly.

Sect 2.2 # 31, 35, 41, 42

$\lim_{x\to 5^+} \frac{x+1}{x-5} = \infty$ since $x+1$ is positive and $x-5>0$ as $x \to 5^+$

(35) $\lim_{x\to 3^+} \ln(x^2-9) = \lim_{t\to 0^+} \ln t = -\infty$ since $t = x^2-9$ approaches 0^+ as x approaches 3^+

(41) $\lim_{x\to 2^+} \frac{x^2-2x-8}{x^2-5x+6} = \lim_{x\to 2^+} \frac{(x-4)(x+2)}{(x-3)(x-2)}$

$= \infty$ since $(x-4)(x+2)<0$ as $x \to 2^+$ and $(x-3)(x-2)<0$ as $x \to 2^+$

(42) $\lim_{x\to 0^+} \left(\frac{1}{x} - \ln x\right) = \lim_{x\to 0^+} \frac{1}{x} - \lim_{x\to 0^+} \ln x$

$= \infty - (-\infty)$

$= \infty + \infty$

$= \infty$

Notice that:

$\lim_{x\to 0^+} \left(\frac{1}{x} + \ln x\right) = \infty$ since $\frac{1}{x} \to \infty$ and $\ln x \to -\infty$ as $x \to 0^+$ but $\frac{1}{x}$ grows faster than $\ln x$ decreases as $x \to 0^+$