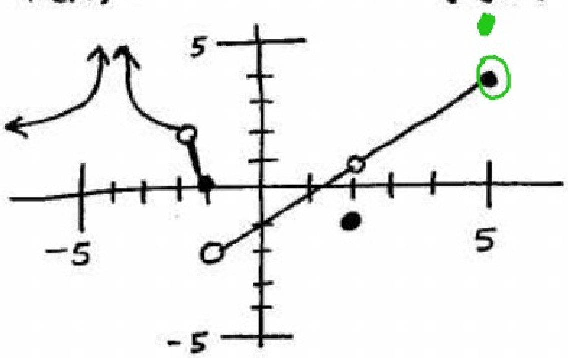
Review - Chapter 2
Notes

$f(x) =$



Domain: $(-\infty,-4)(-4,-2)(-2,5]$

Continuous:
$(-\infty,-4)(-4,-2)(-2,-1)(-1,2)(2,5]$

① $\lim_{x\to -4^-} f(x) = \infty$

$\lim_{x\to -4^+} f(x) = \infty$

$\lim_{x\to -4} f(x) =$ d.n.e.

② $\lim_{x\to -2} f(x) = 2$

Is $f(x)$ continuous @ $x=-2$ no

Explain why or why not b/c $f(-2)=$ d.n.e.

③ $f(0) = -1$

$\lim_{x\to 0} f(x) = -1$

Is $f(x)$ continuous @ $x=0$ yes

Explain why or why not
$f(0)=-1$ / $\lim_{x\to 0} f(x) = -1$ / $f(0) = \lim_{x\to 0} f(x)$

④ $\lim_{x\to 2} f(x) = 1$

$f(2) = -1$

Is $f(x)$ cont. @ $x=2$ No

Explain why or why not
$\lim_{x\to 2} f(x) \neq f(2)$

⑤ Is $f(x)$ continuous @ $x=5$ yes

Explain why or why not
$f(5)$ is an endpt and $f(5)$ exists

⑥ Explain why $\lim_{x\to -1} f(x) =$ d.n.e.

$\lim_{x\to -1^-} f(x) \neq \lim_{x\to -1^+} f(x)$

Review - Chapter 2

Limit

$\longrightarrow \longleftarrow$

As you approach from the left and right you approach the same y-value

Continuity

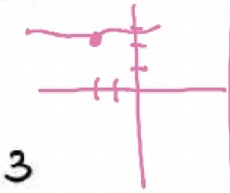
$f(x)$ is a continuous function at $x=c$ iff

1. $f(c)$ exists
2. $\lim_{x \to c} f(x)$ exists
3. $\lim_{x \to c} f(x) = f(c)$

Sketch a possible graph

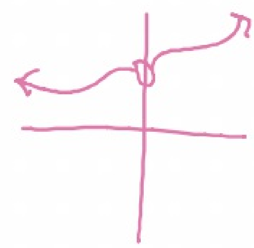
1. $f(-2) = 3$

$\lim_{x \to -2} f(x) = 3$



$f(0) =$ d.n.e.

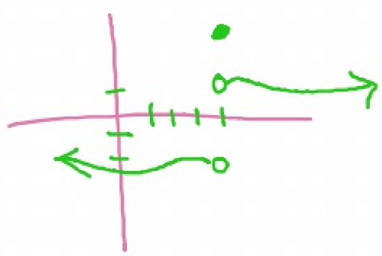
$\lim_{x \to 0} f(x)$ exists



2. $f(4)$ exists

$\lim_{x \to 4^-} f(x) = -2$

$\lim_{x \to 4^+} f(x) = 1$



Review - Chapter 2

Find the points of discontinuity
Identify the type of discontinuity

① $y = \frac{1}{x+1}$ $x = -1$, infinite

② $y = \begin{cases} x+2 & x < 1 \\ 3 & 1 \le x \le 3 \\ x+5 & x > 3 \end{cases}$ $x = 3$ jump

③ $y = \frac{x^2+x-6}{x-2} = \frac{(\cancel{x-2})(x+3)}{(\cancel{x-2})}$ $x = 2$ hole

Find the value of "t" that makes g(x)
continuous at $x = 3$

$$g(x) = \begin{cases} 2x+1 & x \le 3 \\ tx^2 & x > 3 \end{cases}$$

$2x + 1 = tx^2$
$2(3)+1 = t(3)^2$
$7 = 9t$
$\frac{7}{9} = t$

Review – Chapter 2 (Notes)

Find the end behavior model

① $f(x) = 1 + 2x^2 - 3x^3$ $y = -3x^3$

② $f(x) = \dfrac{x^3 + 3x + 4}{x^2 - x^5}$ $y = -\dfrac{1}{x^2} \rightarrow y = 0$ E.B.A

③ $f(x) = \dfrac{6x^2 + 2x - 1}{3x^2 - 4}$ $= y = 2$

Find the limits

① $\lim\limits_{x \to 1} \dfrac{x^2 - 1}{x - 1} = \lim\limits_{x \to 1} \dfrac{2x}{1}$
$= 2$

② $\lim\limits_{x \to 3} 2x + 5 = 2(3) + 5$
$= 11$

③ $\lim\limits_{x \to \infty} 1 + 2x^2 - 3x^3 = -\infty$
$=$ d.n.e.

④ $\lim\limits_{x \to -\infty} \dfrac{4x^3 + 2x}{-x^2} = \lim\limits_{x \to -\infty} -4x$
$= \infty$ OR d.n.e.

⑤ $\lim\limits_{x \to \infty} \dfrac{3x^2 + 2x}{x - 5x^3} = 0$

⑥ $\lim\limits_{x \to 0} \dfrac{\sin 2x}{x} = \dfrac{2 \sin x \cos x}{x}$
$= 2 \cdot 1 \cdot 1 = 2$

$\lim\limits_{x \to 0} \dfrac{\sin x}{x} = 1$

$\lim\limits_{x \to 0} \dfrac{2\cos(2x)}{1} = 2(1)$
$= 2$

Find $\lim_{x \to \infty} \underbrace{2x \cdot e^x}_{\infty \cdot \infty} = \infty$ Explain your answer.

d.n.e.

Find $\lim_{x \to -\infty} \underbrace{2x}_{-\infty} \cdot \underbrace{e^x}_{0}$ Explain your answer

$= 0$

Find the average rate of change of f(x) over the interval $[-1, 2]$

$f(x) = x^2 - 3x$

$$\frac{f(2) - f(-1)}{2 - (-1)}$$

$$= \frac{\left[(2)^2 - 3(2)\right] - \left[(-1)^2 - 3(-1)\right]}{3}$$

$$= -2$$

For the function $f(x) = x^2 + 2x + 1$ @ $x = 3$

a) Find the slope of the curve

$$\lim_{h\to 0} \frac{f(3+h) - f(3)}{(3+h) - 3}$$

$$= \lim_{h\to 0} \frac{\left[(3+h)^2 + 2(3+h) + 1\right] - \left[(3)^2 + 2(3) + 1\right]}{h}$$

$$= \lim_{h\to 0} \frac{8h + h^2}{h}$$

$$= \lim_{h\to 0} 8 + h$$

$$= 8$$

b) Write the equation of the tangent line

pt. $(3, f(3))$ $(3, 16)$

slope $f'(3) = 8$

$y - 16 = 8(x - 3)$

c) Write the equation of the normal

$y - 16 = -\frac{1}{8}(x - 3)$