1 | Openstax Calc vol 1 chap 2.4 ex 134

$$g(t) = \frac{1}{t} + 1$$

which is basically $\frac{1}{x}$ shied up by one, so there is an infinite discontinuity at x=0

2 | 136

There is a jump discontinuity at x=2, because normally $y=\frac{x}{x}$ simplifies to y=1, but the sign flips at x=2.

3 | 142

$$f(y) = \frac{\sin(\pi y)}{\tan(\pi y)} = \frac{\sin(\pi y)\cos(\pi y)}{\sin(\pi y)}$$

So there is a removable discontinuity at y=1, because there is a discontinuity but it can be removed with algebra.

4 | 148

$$e^{4k} = 4 + 3$$
$$e^{4k} = 7$$
$$4k = \ln(7)$$
$$k = \frac{\ln(7)}{4}$$

5 | TODO 174

Prove f(x) is continues everywhere, meaning show that $\forall c \in \mathbb{R}$

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

Because we can always evaluate f(x), the limit always exists.

6 | Paul's online math notes Section 2-9: 23

The IVT states that when a function is continuous over a closed interval [a,b], then for all $\min\{f(a),f(b)\}\le y\le \max\{f(a),f(b)\}$ there exists some $a\le c\le b$ s.t. f(c)=y. In this case, we have f(4)=193 and f(8)=-511. f(x) is a polynomial, so it is continuous over the range. Because our values stradle zero, there must be some value $4\le c\le 8$ s.t. f(c)=0.

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7 | Boundedness theorem

Given a function f(x) that is continuous on a closed interval [a,b], there exists some $M \in \mathbb{R}$ s.t. $f(c) \leq M$ for all $a \leq c \leq b$ aka M is an upper bound on f(x) over the interval [a,b]. There's also one that's less than all c. Doesn't work for open intervals.

7.1 \mid (0, 1]: not continuous, not a closed interval

7.2 $\mid [0, 1)$: not a closed interval

7.3 \mid (0, 1]: not a closed interval

7.4 $\mid (0, 1]$: not continuous, not a closed interval

7.5 | $f(x) = \frac{1}{x}$: not continuous

8 | Epilouge

Other than Problem 5, this took roughly 40 minutes. I still don't know how to do problem 5...

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