Solutions to some suggested problems
MATH 251.03(04), CALCULUS I, FALL 2013

- Our first exam will cover Sections 1.1, 1.5, 1.5 to Section 2.1−2.7 excluding Section 2.4 with greater emphasis on Chapter 2.
- You are responsible for all materials covered in the lecture, homework problems quiz problems and the following list of suggested problems
  Section 1.1: 4, 7-10,31-37,43,45,51,53,61,63,79,80
  Section 1.3: 4,18,24,28,32,38,43,52,55
  Section 1.5: 1,11,14,16,19,21,30
  Section 2.1: 1,3,8
  Section 2.2: 4,5,7,8,11,12,15-18,29,30
  Section 2.3: 2,4,5,9,11-32,37,47,48,49
  Section 2.5: 3,4,5-8,17,18-20,23,24,45,51,54
  Section 2.6:3,5,7,13,15-38
  Section 2.7:1,7,13,16,17,18,21,22,27-32,39,40

Section 2.2 #4
a $lim_{x\to 2^-} f(x) = 3$
b $\lim_{\to 2^+} f(x) = 1$
c Since the right and left hand limits do not agree $\lim_{x\to 2}(f(x))$ does not exist.
d $f(2) = 4$
e $\lim_{x\to 4} f(x) = 4$
f $f(4)$ does not exist.

Section 2.2 #8
a $\lim_{x\to 2} R(x) = -\infty$
b $\lim_{x\to 5} R(x) = \infty$
c $\lim_{x\to -3^-} R(x) = -\infty$
d $\lim_{x\to -3^+} R(x) = \infty$

Section 2.2 #12 $\lim_{x\to a} f(x)$ exists for all a except at $a = \pi$.

Section 2.2 #30

$$lim_{x\to -3^-} \frac{x+2}{x+3} = \infty$$

because the numerator is negative and the denominator approaches 0 from the negative side as $x \to -3^-$.

Section 2.3 #4 Ans $= -4$. Just plug in!

Section 2.3 #12 Ans $= \frac{4}{5}$. Factor the numerator and denominator and cancel $(x-4)$.

Section 2.3 #14 Ans = limit does not exist since:

$$lim_{x\to -1} \frac{x^2-4x}{x^2-3x-4} = \lim_{x\to -1} \frac{x}{x+1}$$

which does not exist because $\lim_{x\to -1} \dfrac{x}{x+1}$ is $-\infty$ from the right and $+\infty$ from the left!

Section 2.3 #16 Ans $= \dfrac{1}{4}$

Section 2.3 #18 Ans $= 12$

Section 2.3 #20 Ans $= \dfrac{4}{3}$ Hint : $t^3 - 1 = (t-1)(t^2+t+1)$ and $t^4 - 1 = (t^2-1)(t^2+1)$.

Section 2.3 #22 Ans $= \dfrac{2}{3}$

Section 2.3 #24 Ans $= 0$.

Section 2.3 #26 Ans $= 1$.

Section 2.3 #28 Ans $= -\dfrac{1}{9}$

Section 2.3 #30 Ans $= -\dfrac{4}{5}$

Section 2.3 #32 Ans $= -\dfrac{2}{x^3}$.

Section 2.5 # 4 g is continuous on $[-4,-2), (-2,2), [2,4), (4,6)$ and $(6,8)$.

Section 2.5 #18 $f(-2) = 1$ but $\lim_{x\to -2^-} f(x) = -\infty$ and $\lim_{-2^+} f(x) = \infty$, so $\lim_{x\to -2} f(x)$ does not exist and f is discontinuous at -2.

Section 2.5 #20 $\lim_{x\to 1} f(x) = \dfrac{1}{2}$ but $f(1) = 1$ so f is discontinuous at $x = 1$.

Section 2.5 #24 f is continuous at $x = 2$.

Section 2.5 #45 f is continuous on $(-\infty, 2)$ and $(2, \infty)$. Now $\lim_{x\to 2^{(-)}} f(x) = lim_{x\to 2^-}(cx^2+2x) = 4c+4$ and $\lim_{x\to 2^+} f(x) = \lim_{x\to 2^+}(x^3 - cx) = 8 - 2c$. If f is to be continuous these 2 limits should match so we have to find c such that $4c + 4 = 8 - 2c$. Solve for c Ans $= \dfrac{2}{3}$.

Section 2.6 #16 Ans $=0$.

Section 2.6 #18 Ans $=2$

Section 2.6 #20 Ans $=\dfrac{-1}{2}$

Section 2.6 #22 Ans $=1$

Section 2.6 #24 Ans $=-3$

Section 2.6 #26 Ans $=-1$ Hint: multliply by $\dfrac{x - \sqrt{x^2+2x}}{x = \sqrt{x^2+2x}}$

Section 2.6 #28 Ans $=\infty$

Section 2.6 #30 Ans = Limit does not exist! Notice that $\lim_{x\to\infty} = 0$, but $\lim_{x\to\infty} 2\cos(3x)$ does not exist because the values of $2\cos(3x)$ oscillate between $[-2, 2]$ as $x \to \infty$.

Section 2.6 #32 Ans $= \infty$

Section 2.7 #28 Ans $= 6a^2 + 1$.

Section 2.7 #30 Ans $= \dfrac{-2}{a^3}$.

Section 2.7 #32 Ans $= \dfrac{2}{(1-a)^{3/2}}$