p.33

2. $h = 58t - .83t^2$

a. i. $\frac{h(1)-h(2)}{1-2} = \frac{57.17 - 112.68}{1-2} = 55.51$ m/s

ii. $\frac{h(1)-h(1.5)}{1-1.5} = \frac{57.17 - 85.1325}{-.5} = 55.925$ m/s

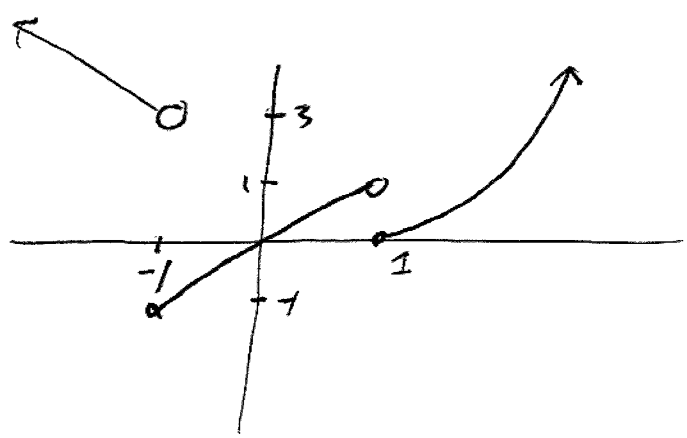
iii. $\frac{h(1)-h(1.1)}{1-1.1} = \frac{57.17 - 62.7957}{-.1} = 56.257$ m/s

iv $\frac{h(1)-h(1.01)}{1-1.01} = \frac{57.17 - 57.733317}{-.01} = 56.3317$ m/s

v $\frac{h(1)-h(1.001)}{1-1.001} = \frac{57.17 - 57.22633917}{-.001} = 56.3397$ m/s

b. I estimate 56.34 m/s

6.



limit exists except for $x = \pm 1$

12. Let $f(x) = \dfrac{x^2 - 2x}{x^2 - x - 2}$

$f(0) = 0$ $\qquad$ $f(2) = 2$

$f(-.5) = -1$ $\qquad$ $f(-1.5) = 3$

$f(-.9) = -9$ $\qquad$ $f(-1.1) = 11$

$f(-.95) = -19$ $\qquad$ $f(-1.01) = 101$

$f(-.99) = -99$ $\qquad$ $f(-1.001) = 1001$

$f(-.999) = -999$

This limit does not exist!

13. $\lim\limits_{x \to 0} \dfrac{\sin x}{x + \tan x}$ this function is even, so $f(x) = f(-x)$!

x $f(\pm 1) = .329$

$f(\pm .5) = .4582$

$f(\pm .2) = .49333$

$f(\pm .1) = .498333$

$f(\pm .05) = .499583$

$f(\pm .01) = .499983$

I gues limit is $1/2$

15. $f(x) = \dfrac{\sqrt{x+4} - 2}{x}$

x	$f(x)$
.1	.24845
.01	.24984
.001	.249984
-.001	~~.2079~~ .250016
-.0001	

I gues $\lim\limits_{x \to 0} f(x) = 0.25$

18. $\lim_{x \to 0} \frac{9^x - 5^x}{x}$

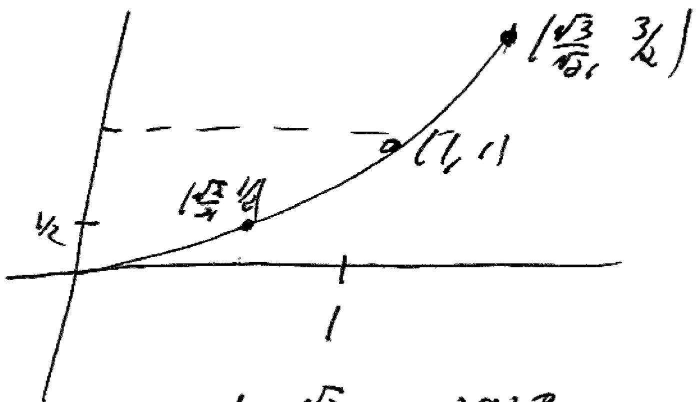
x	$f(x)$
.1	.711119
.01	.588022
.001	.588404
-.1	.4754
-.01	.5767
-.001	.5866624

$f(-.000001) = .5878000$

$f(.000001) = .5880000$

I guess $\lim \approx .588$

24.



$1 - \frac{\sqrt{2}}{2} = .2928..$

$\sqrt{3/2} - 1 = .224744..$

Choose $\delta = \sqrt{3/2} - 1$

(or any smaller #)

1.3

#30 $\lim\limits_{x \to -2} \left(\frac{1}{2}x+3\right) = 2$.

Proof Let $\varepsilon > 0$. Choose $\delta = 2\varepsilon$. Suppose $0 < \underset{|x+2|}{\underset{\parallel}{|x - -2|}} < \delta$

Then $|f(x)-L| = \left|\frac{1}{2}x+3-2\right|$
$= \left|\frac{1}{2}x+1\right| = \frac{1}{2}|x+2| < \frac{1}{2}\delta = \varepsilon$

Thus $0<|x+2|<\delta \Rightarrow |f(x)-L| < \varepsilon$ as required. //

#38 $\lim\limits_{x \to a} c = c$.

Proof Let $\varepsilon > 0$. Choose $\delta = 1$ (any δ works here!!)

If $0<|x-a|<\delta$ then $|f(x)-L| = |c-c| = 0 < \varepsilon$ as required

44. $\lim\limits_{x \to 3} x^2+x-4 = 8$

Proof

Let $\varepsilon > 0$ be given. Choose $\delta = \text{minimum}(1, \varepsilon/8)$.
When $|x-3|<1$ then $|x+4|<8$. So for $0<|x-3|<\delta$ we have

$|f(x)-8| = |x^2+x-12| = |x+4|\,|x-3|$
$< 8|x-3| < \varepsilon$ as required.

1.4

1. a. 5 b. 9 c. 2 d. $-1/3$

e. $-3/8$ f. 0 g. DNE, $\lim \frac{f}{g}$ rule only applies if $\lim_{x\to a} g = 0$

h. $-4/11$

2. a. 2 b. DNE, $\lim_{x\to 1} g(x)$ DNE c. 0 d. DNE since $\lim_{x\to -1} g(x) = 0$

e. 16 f. 2

10a. $\frac{x^2+x-6}{x-2} = x+3$ does not hold when $x=2$ since we can't cancel $x-2$ then.

b. $\lim_{x\to 2} \frac{x^2+x-6}{x-2} = \lim_{x\to 2} x+3$

is still correct because $\frac{x^2+x-6}{x-2} = x+3$ for any

x except $x=2$ and changing the function at

$x=2$ does not change the limit!

18. $\lim_{h\to 0} \frac{\sqrt{1+h}-1}{h} = \lim_{h\to 0} \frac{1+h-1}{h(\sqrt{1+h}+1)} = \lim_{h\to 0} \frac{1}{\sqrt{1+h}+1} = 1/2$

31. $-1 \le \cos\left(\frac{2}{x}\right) \le 1$ so

$$-x^4 \le \cos\left(\frac{2}{x}\right)x^4 \le x^4$$

and $\lim_{x\to 0} x^4 = \lim_{x\to 0} -x^4 = 0$ so

$\lim_{x\to 0} x^2\cos\left(\frac{2}{x}\right) = 0$ by Squeeze Thm.

34. $$\frac{2x+12}{|x+6|} = 2\cdot\frac{x+6}{|x+6|} = \begin{cases} 2 & x>-6 \\ -2 & x<-6 \\ DNE & x=-6 \end{cases}$$

Thus $\lim_{x\to -6} \frac{2x+12}{x+6}$ DNE

43. $$\lim_{x\to 0} \frac{\sin 3x}{x} = 3\lim_{x\to 0} \frac{\sin 3x}{3} = 3$$