

# CHAPTER 2

## Limits and Continuity

### EXERCISE SET 2.1

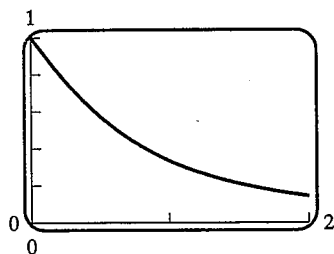
1. (a) 0 (b) 0 (c) 0 (d) 3
2. (a)  $+\infty$  (b)  $+\infty$  (c)  $+\infty$  (d) undef
3. (a)  $-\infty$  (b)  $-\infty$  (c)  $-\infty$  (d) 1
4. (a) 1 (b)  $-\infty$  (c) does not exist (d)  $-2$

5. for all  $x_0 \neq -4$

6. for all  $x_0 \neq -6, 3$

13. (a)

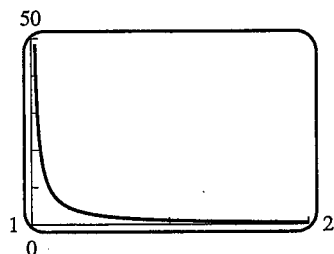
|        |        |        |        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2      | 1.5    | 1.1    | 1.01   | 1.001  | 0      | 0.5    | 0.9    | 0.99   | 0.999  |
| 0.1429 | 0.2105 | 0.3021 | 0.3300 | 0.3330 | 1.0000 | 0.5714 | 0.3690 | 0.3367 | 0.3337 |



The limit is  $1/3$ .

(b)

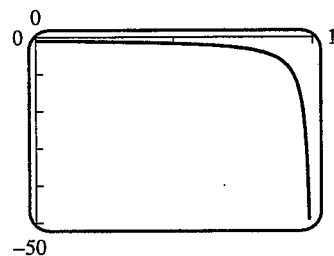
|        |        |       |       |       |        |
|--------|--------|-------|-------|-------|--------|
| 2      | 1.5    | 1.1   | 1.01  | 1.001 | 1.0001 |
| 0.4286 | 1.0526 | 6.344 | 66.33 | 666.3 | 6666.3 |



The limit is  $+\infty$ .

(c)

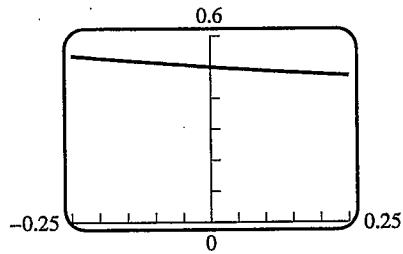
|    |         |         |         |        |         |
|----|---------|---------|---------|--------|---------|
| 0  | 0.5     | 0.9     | 0.99    | 0.999  | 0.9999  |
| -1 | -1.7143 | -7.0111 | -67.001 | -667.0 | -6667.0 |



The limit is  $-\infty$ .

14. (a)

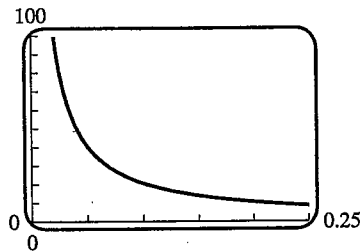
|        |        |        |         |        |        |        |        |
|--------|--------|--------|---------|--------|--------|--------|--------|
| -0.25  | -0.1   | -0.001 | -0.0001 | 0.0001 | 0.001  | 0.1    | 0.25   |
| 0.5359 | 0.5132 | 0.5001 | 0.5000  | 0.5000 | 0.4999 | 0.4881 | 0.4721 |



The limit is  $1/2$ .

(b)

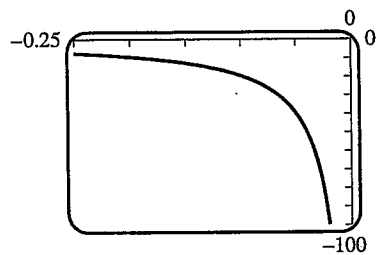
|        |        |        |        |
|--------|--------|--------|--------|
| 0.25   | 0.1    | 0.001  | 0.0001 |
| 8.4721 | 20.488 | 2000.5 | 20001  |



The limit is  $+\infty$ .

(c)

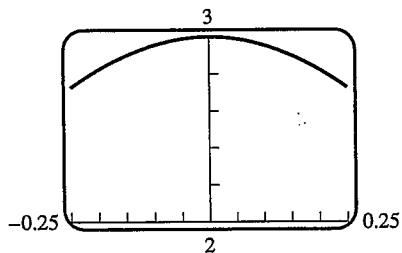
|         |         |         |         |
|---------|---------|---------|---------|
| -0.25   | -0.1    | -0.001  | -0.0001 |
| -7.4641 | -19.487 | -1999.5 | -20000  |



The limit is  $-\infty$ .

15. (a)

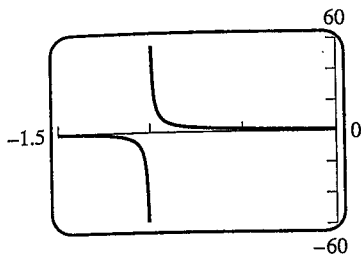
|        |        |        |         |        |        |        |        |
|--------|--------|--------|---------|--------|--------|--------|--------|
| -0.25  | -0.1   | -0.001 | -0.0001 | 0.0001 | 0.001  | 0.1    | 0.25   |
| 2.7266 | 2.9552 | 3.0000 | 3.0000  | 3.0000 | 3.0000 | 2.9552 | 2.7266 |



The limit is 3.

(b)

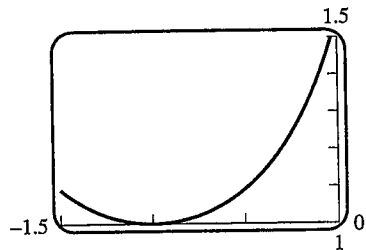
|   |        |        |       |        |         |        |        |        |
|---|--------|--------|-------|--------|---------|--------|--------|--------|
| 0 | -0.5   | -0.9   | -0.99 | -0.999 | -1.5    | -1.1   | -1.01  | -1.001 |
| 1 | 1.7552 | 6.2161 | 54.87 | 541.1  | -0.1415 | -4.536 | -53.19 | -539.5 |



The limit does not exist.

16. (a)

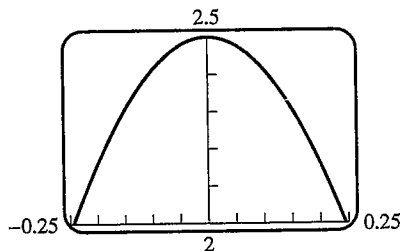
|        |        |        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0      | -0.5   | -0.9   | -0.99  | -0.999 | -1.5   | -1.1   | -1.01  | -1.001 |
| 1.5574 | 1.0926 | 1.0033 | 1.0000 | 1.0000 | 1.0926 | 1.0033 | 1.0000 | 1.0000 |



The limit is 1.

(b)

|        |        |        |         |        |        |        |        |
|--------|--------|--------|---------|--------|--------|--------|--------|
| -0.25  | -0.1   | -0.001 | -0.0001 | 0.0001 | 0.001  | 0.1    | 0.25   |
| 1.9794 | 2.4132 | 2.5000 | 2.5000  | 2.5000 | 2.5000 | 2.4132 | 1.9794 |



The limit is 5/2.

17.  $m_{\text{sec}} = \frac{x^2 - 1}{x + 1} = x - 1$  which gets close to  $-2$  as  $x$  gets close to  $-1$ , thus  $y - 1 = -2(x + 1)$  or  $y = -2x - 1$

18.  $m_{\text{sec}} = \frac{x^2}{x} = x$  which gets close to  $0$  as  $x$  gets close to  $0$  (doh!), thus  $y = 0$

19.  $m_{\text{sec}} = \frac{x^4 - 1}{x - 1} = x^3 + x^2 + x + 1$  which gets close to  $4$  as  $x$  gets close to  $1$ , thus  $y - 1 = 4(x - 1)$  or  $y = 4x - 3$

20.  $m_{\text{sec}} = \frac{x^4 - 1}{x + 1} = x^3 - x^2 + x - 1$  which gets close to  $-4$  as  $x$  gets close to  $-1$ , thus  $y - 1 = -4(x + 1)$  or  $y = -4x - 3$