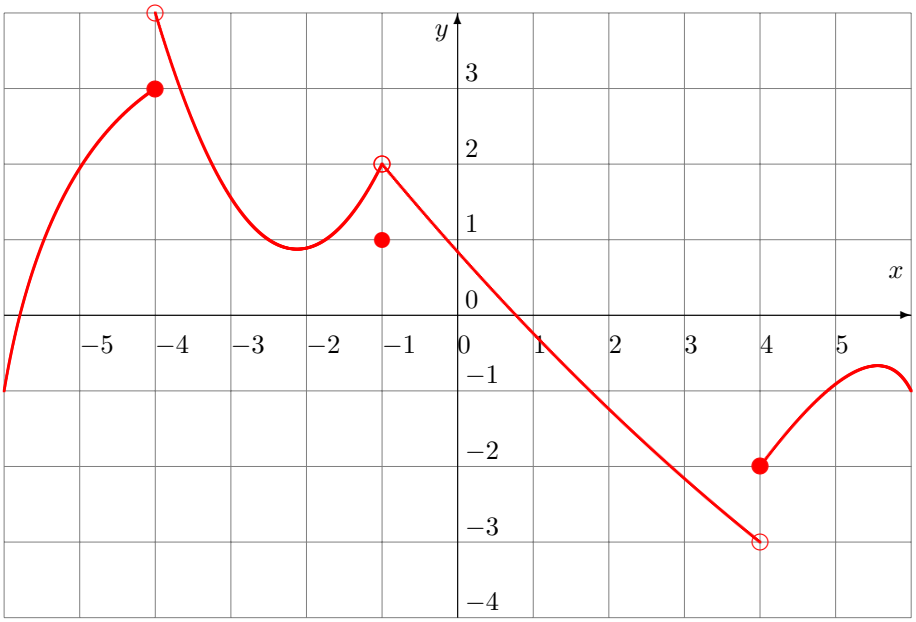
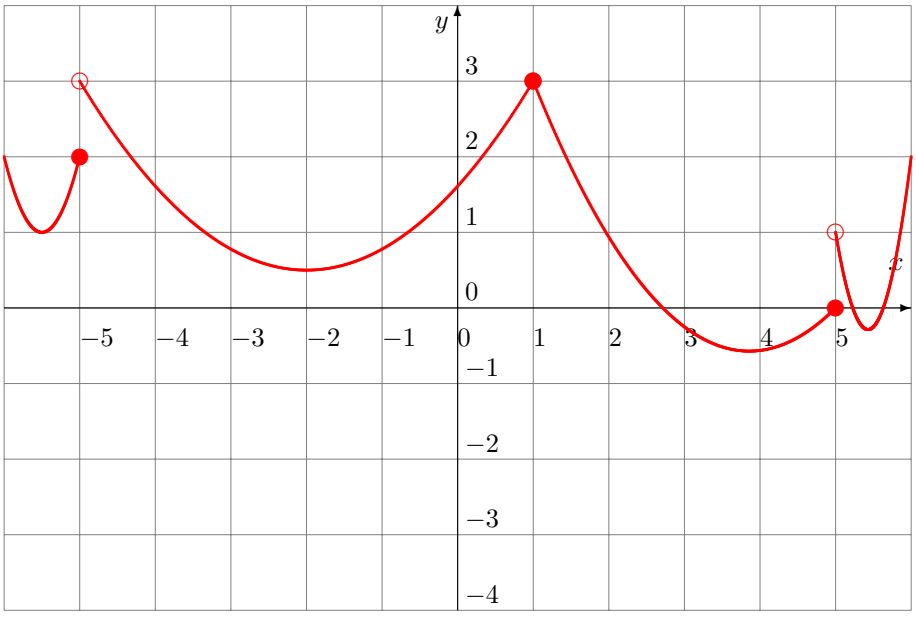
1. Consider the following function defined by its graph:



Find the following limits:

a) $\lim_{x\to -1^-} f(x)$ *b)* $\lim_{x\to -1^+} f(x)$ *c)* $\lim_{x\to -1} f(x)$ *d)* $\lim_{x\to -4} f(x)$ *e)* $\lim_{x\to 4} f(x)$

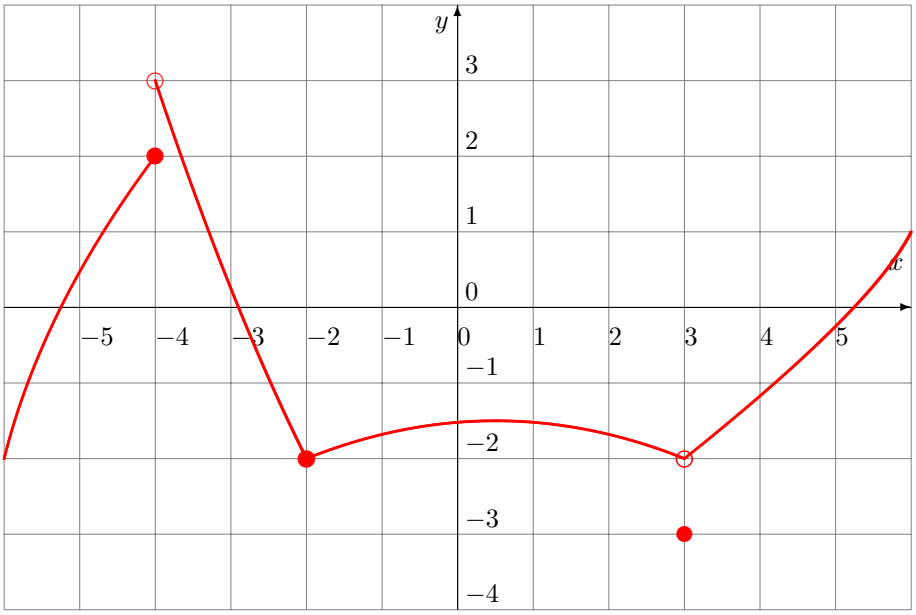
2. Consider the following function defined by its graph:



Find the following limits:

a) $\lim_{x\to 1^-} f(x)$ *b)* $\lim_{x\to 1^+} f(x)$ *c)* $\lim_{x\to 1} f(x)$ *d)* $\lim_{x\to -5} f(x)$ *e)* $\lim_{x\to 5} f(x)$

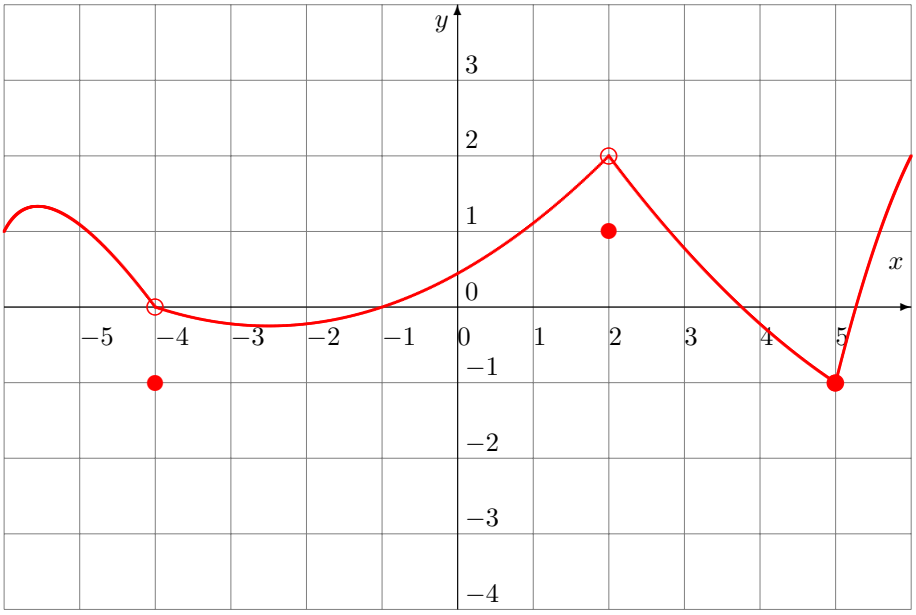
3. Consider the following function defined by its graph:



Find the following limits:

a) $\lim_{x\to -2^-} f(x)$ *b)* $\lim_{x\to -2^+} f(x)$ *c)* $\lim_{x\to -2} f(x)$ *d)* $\lim_{x\to -4} f(x)$ *e)* $\lim_{x\to 3} f(x)$

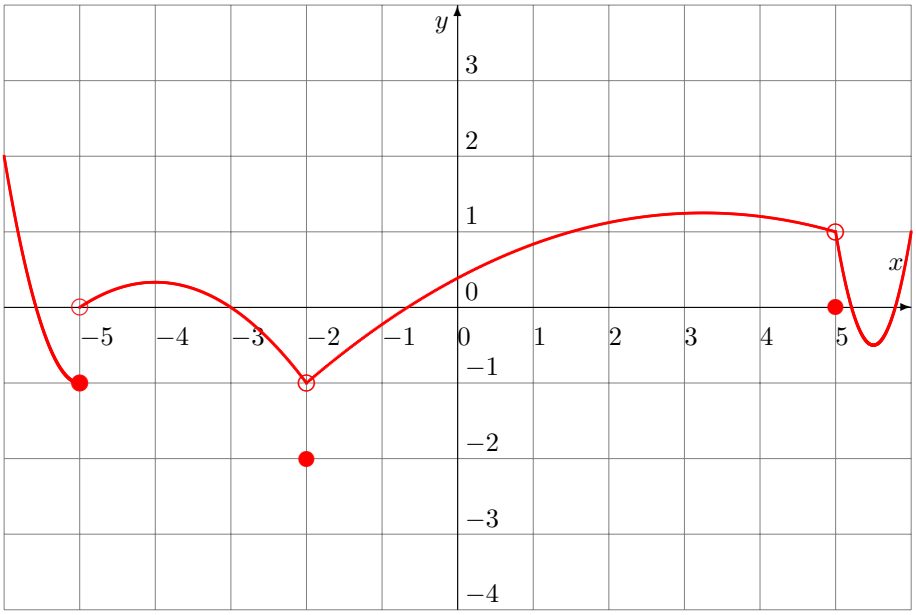
4. Consider the following function defined by its graph:



Find the following limits:

a) $\lim_{x\to 2^-} f(x)$ *b)* $\lim_{x\to 2^+} f(x)$ *c)* $\lim_{x\to 2} f(x)$ *d)* $\lim_{x\to -4} f(x)$ *e)* $\lim_{x\to 5} f(x)$

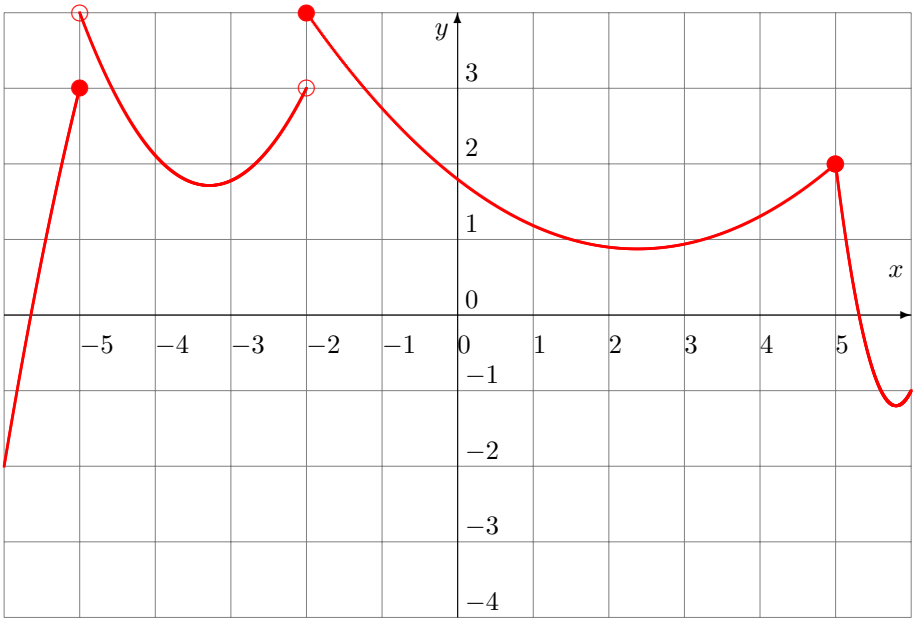
5. Consider the following function defined by its graph:



Find the following limits:

a) $\lim_{x\to -2^-} f(x)$ *b)* $\lim_{x\to -2^+} f(x)$ *c)* $\lim_{x\to -2} f(x)$ *d)* $\lim_{x\to -5} f(x)$ *e)* $\lim_{x\to 5} f(x)$

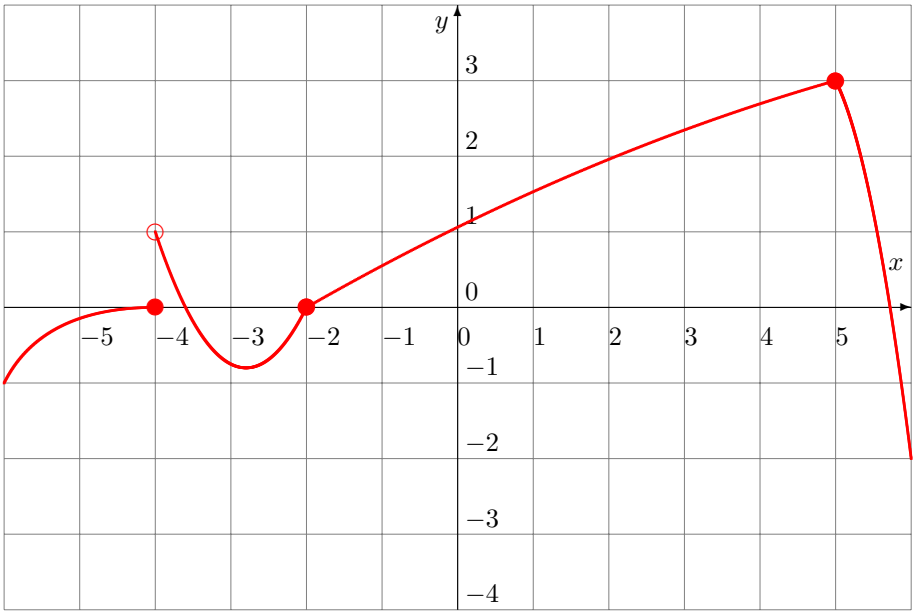
6. Consider the following function defined by its graph:



Find the following limits:

a) $\lim_{x\to -2^-} f(x)$ *b)* $\lim_{x\to -2^+} f(x)$ *c)* $\lim_{x\to -2} f(x)$ *d)* $\lim_{x\to -5} f(x)$ *e)* $\lim_{x\to 5} f(x)$

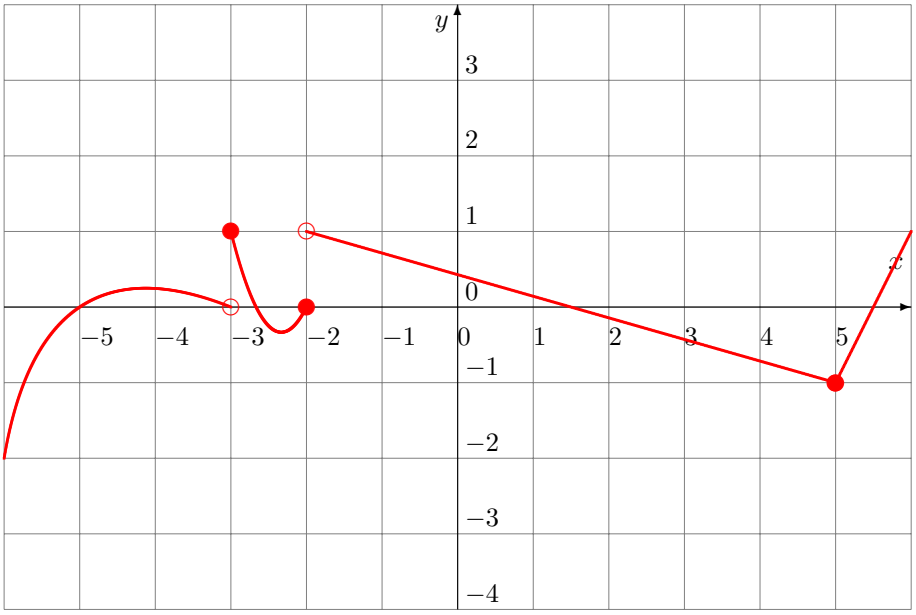
7. Consider the following function defined by its graph:



Find the following limits:

a) $\lim_{x\to -2^-} f(x)$ *b)* $\lim_{x\to -2^+} f(x)$ *c)* $\lim_{x\to -2} f(x)$ *d)* $\lim_{x\to -4} f(x)$ *e)* $\lim_{x\to 5} f(x)$

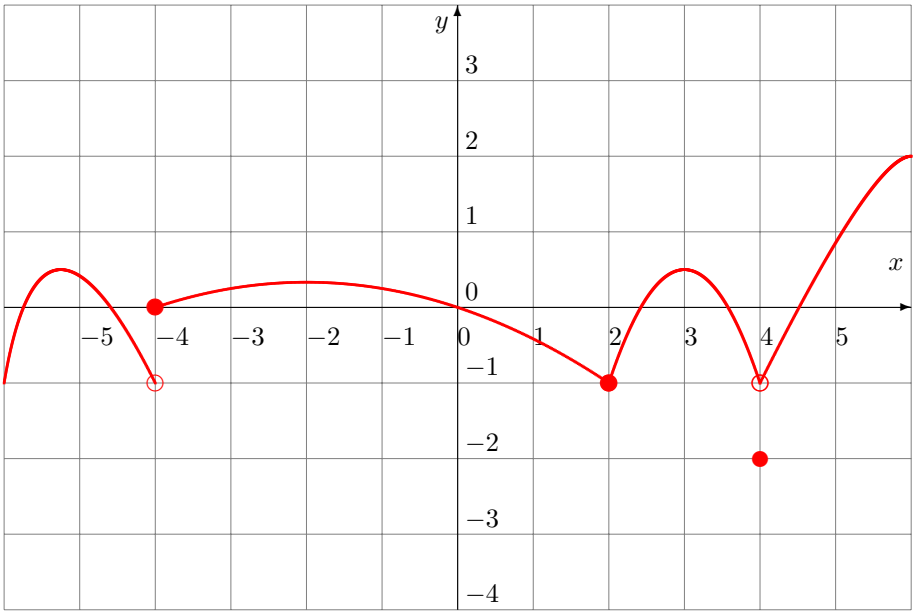
8. Consider the following function defined by its graph:



Find the following limits:

a) $\lim_{x\to -2^-} f(x)$ *b)* $\lim_{x\to -2^+} f(x)$ *c)* $\lim_{x\to -2} f(x)$ *d)* $\lim_{x\to -3} f(x)$ *e)* $\lim_{x\to 5} f(x)$

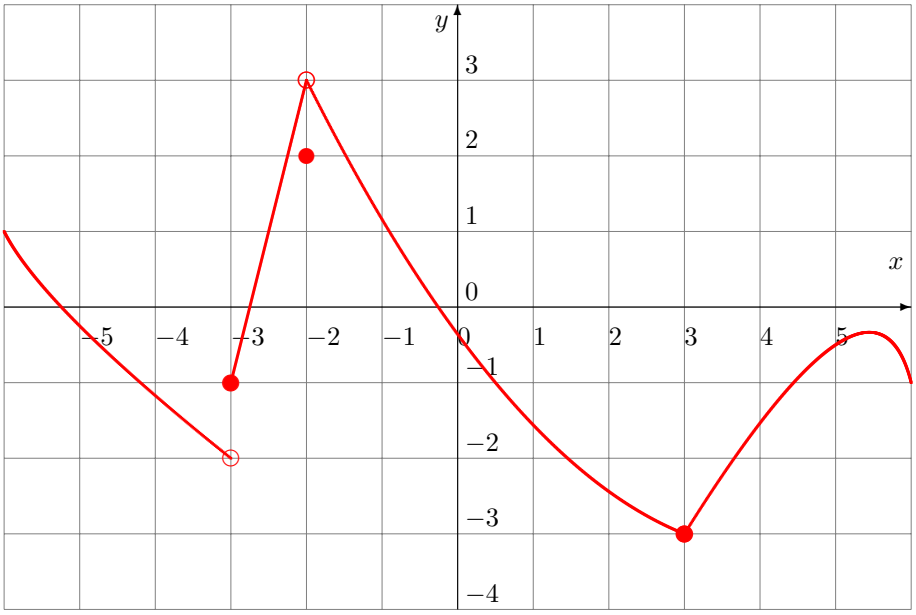
9. Consider the following function defined by its graph:



Find the following limits:

a) $\lim_{x\to 2^-} f(x)$ *b)* $\lim_{x\to 2^+} f(x)$ *c)* $\lim_{x\to 2} f(x)$ *d)* $\lim_{x\to -4} f(x)$ *e)* $\lim_{x\to 4} f(x)$

10. Consider the following function defined by its graph:



Find the following limits:

a) $\lim_{x\to -2^-} f(x)$ *b)* $\lim_{x\to -2^+} f(x)$ *c)* $\lim_{x\to -2} f(x)$ *d)* $\lim_{x\to -3} f(x)$ *e)* $\lim_{x\to 3} f(x)$

Answers: 1. a) 2 b) 2 c) 2 d) DNE e) DNE
2. a) 3 b) 3 c) 3 d) DNE e) DNE
3. a) -2 b) -2 c) -2 d) DNE e) -2
4. a) 2 b) 2 c) 2 d) 0 e) -1
5. a) -1 b) -1 c) -1 d) DNE e) 1
6. a) 3 b) 4 c) DNE d) DNE e) 2
7. a) 0 b) 0 c) 0 d) DNE e) 3
8. a) 0 b) 1 c) DNE d) DNE e) -1
9. a) -1 b) -1 c) -1 d) DNE e) -1
10. a) 3 b) 3 c) 3 d) DNE e) -3

Solutions:

1.
a) $\lim_{x\to -1^-} f(x) = 2$
b) $\lim_{x\to -1^+} f(x) = 2$
c) $\lim_{x\to -1^-} f(x) = \lim_{x\to -1^+} f(x)$. Therefore $\lim_{x\to -1} f(x) = 2$
d) $\lim_{x\to -4^-} f(x) \neq \lim_{x\to -4^+} f(x)$. Therefore $\lim_{x\to -4} f(x) = \text{DNE}$
e) $\lim_{x\to 4^-} f(x) \neq \lim_{x\to 4^+} f(x)$. Therefore $\lim_{x\to 4} f(x) = \text{DNE}$

2.
a) $\lim_{x\to 1^-} f(x) = 3$
b) $\lim_{x\to 1^+} f(x) = 3$
c) $\lim_{x\to 1^-} f(x) = \lim_{x\to 1^+} f(x)$. Therefore $\lim_{x\to 1} f(x) = 3$
d) $\lim_{x\to -5^-} f(x) \neq \lim_{x\to -5^+} f(x)$. Therefore $\lim_{x\to -5} f(x) = \text{DNE}$
e) $\lim_{x\to 5^-} f(x) \neq \lim_{x\to 5^+} f(x)$. Therefore $\lim_{x\to 5} f(x) = \text{DNE}$

3.
a) $\lim_{x\to -2^-} f(x) = -2$
b) $\lim_{x\to -2^+} f(x) = -2$
c) $\lim_{x\to -2^-} f(x) = \lim_{x\to -2^+} f(x)$. Therefore $\lim_{x\to -2} f(x) = -2$
d) $\lim_{x\to -4^-} f(x) \neq \lim_{x\to -4^+} f(x)$. Therefore $\lim_{x\to -4} f(x) = \text{DNE}$
e) $\lim_{x\to 3^-} f(x) = \lim_{x\to 3^+} f(x)$. Therefore $\lim_{x\to 3} f(x) = -2$

4.
a) $\lim_{x\to 2^-} f(x) = 2$
b) $\lim_{x\to 2^+} f(x) = 2$
c) $\lim_{x\to 2^-} f(x) = \lim_{x\to 2^+} f(x)$. Therefore $\lim_{x\to 2} f(x) = 2$
d) $\lim_{x\to -4^-} f(x) = \lim_{x\to -4^+} f(x)$. Therefore $\lim_{x\to -4} f(x) = 0$
e) $\lim_{x\to 5^-} f(x) = \lim_{x\to 5^+} f(x)$. Therefore $\lim_{x\to 5} f(x) = -1$

5.
a) $\lim_{x\to -2^-} f(x) = -1$
b) $\lim_{x\to -2^+} f(x) = -1$
c) $\lim_{x\to -2^-} f(x) = \lim_{x\to -2^+} f(x)$. Therefore $\lim_{x\to -2} f(x) = -1$
d) $\lim_{x\to -5^-} f(x) \neq \lim_{x\to -5^+} f(x)$. Therefore $\lim_{x\to -5} f(x) = \text{DNE}$
e) $\lim_{x\to 5^-} f(x) = \lim_{x\to 5^+} f(x)$. Therefore $\lim_{x\to 5} f(x) = 1$

6.
a) $\lim_{x\to -2^-} f(x) = 3$
b) $\lim_{x\to -2^+} f(x) = 4$
c) $\lim_{x\to -2^-} f(x) \neq \lim_{x\to -2^+} f(x)$. Therefore $\lim_{x\to -2} f(x) = \text{DNE}$
d) $\lim_{x\to -5^-} f(x) \neq \lim_{x\to -5^+} f(x)$. Therefore $\lim_{x\to -5} f(x) = \text{DNE}$
e) $\lim_{x\to 5^-} f(x) = \lim_{x\to 5^+} f(x)$. Therefore $\lim_{x\to 5} f(x) = 2$

7.
a) $\lim_{x\to -2^-} f(x) = 0$
b) $\lim_{x\to -2^+} f(x) = 0$
c) $\lim_{x\to -2^-} f(x) = \lim_{x\to -2^+} f(x)$. Therefore $\lim_{x\to -2} f(x) = 0$
d) $\lim_{x\to -4^-} f(x) \neq \lim_{x\to -4^+} f(x)$. Therefore $\lim_{x\to -4} f(x) = \text{DNE}$
e) $\lim_{x\to 5^-} f(x) = \lim_{x\to 5^+} f(x)$. Therefore $\lim_{x\to 5} f(x) = 3$

8.
a) $\lim_{x\to -2^-} f(x) = 0$
b) $\lim_{x\to -2^+} f(x) = 1$
c) $\lim_{x\to -2^-} f(x) \neq \lim_{x\to -2^+} f(x)$. Therefore $\lim_{x\to -2} f(x) = \text{DNE}$
d) $\lim_{x\to -3^-} f(x) \neq \lim_{x\to -3^+} f(x)$. Therefore $\lim_{x\to -3} f(x) = \text{DNE}$
e) $\lim_{x\to 5^-} f(x) = \lim_{x\to 5^+} f(x)$. Therefore $\lim_{x\to 5} f(x) = -1$

9.
a) $\lim_{x\to 2^-} f(x) = -1$
b) $\lim_{x\to 2^+} f(x) = -1$
c) $\lim_{x\to 2^-} f(x) = \lim_{x\to 2^+} f(x)$. Therefore $\lim_{x\to 2} f(x) = -1$
d) $\lim_{x\to -4^-} f(x) \neq \lim_{x\to -4^+} f(x)$. Therefore $\lim_{x\to -4} f(x) = \text{DNE}$
e) $\lim_{x\to 4^-} f(x) = \lim_{x\to 4^+} f(x)$. Therefore $\lim_{x\to 4} f(x) = -1$

10.
a) $\lim_{x\to -2^-} f(x) = 3$
b) $\lim_{x\to -2^+} f(x) = 3$
c) $\lim_{x\to -2^-} f(x) = \lim_{x\to -2^+} f(x)$. Therefore $\lim_{x\to -2} f(x) = 3$
d) $\lim_{x\to -3^-} f(x) \neq \lim_{x\to -3^+} f(x)$. Therefore $\lim_{x\to -3} f(x) = \text{DNE}$
e) $\lim_{x\to 3^-} f(x) = \lim_{x\to 3^+} f(x)$. Therefore $\lim_{x\to 3} f(x) = -3$