1. Sol.
(a) \[ f(-1) = -0.5000 \\
\quad f(-0.1) = 0.8330 \\
\quad f(0) = 1 \\
\quad f(0.1) = 1.1718 \\
\quad f(1) = 3 \]
(b) The average rate of change of \( f(x) \) on \([-0.1, 0] \) is
\[ \frac{f(0) - f(-0.1)}{0 - (-0.1)} = \frac{1 - 0.8330}{0.1} = 1.67 \]
(c) The average rate of change of \( f(x) \) on \([0, 0.1] \) is
\[ \frac{f(0.1) - f(0)}{0.1 - 0} = \frac{1.1718 - 1}{0.1} = 1.718 \]
(d) The instantaneous rate of change of \( f(x) \) at \( x = 0 \) can be estimated by taking the average of the average rates in Parts (b) and (c) above:
\[ \frac{1.67 + 1.718}{2} = 1.6940 \]

2. Sol.
(a) The function is continuous at \( x = 2 \).
(b) The function is discontinuous at \( x = 3 \). It is neither left-continuous nor right-continuous at \( x = 3 \).
(c) The function is discontinuous at \( x = 5 \). It is left-continuous at \( x = 5 \).
(d) The function is continuous at \( x = 5.001 \). 

3. Sol. The answer is C.

4. Sol. The answer is B.

5. Sol. The answer is C since
\[ \lim_{x \to \infty} f(x) = \lim_{x \to \infty} \frac{x}{1-x} = \lim_{x \to \infty} \frac{x}{x(\frac{1}{x} - 1)} = \lim_{x \to \infty} \frac{1}{\frac{1}{x} - 1} = \frac{1}{0 - 1} = -1 \]

6. Sol. The answer is D.

7. Sol. The answer is D.
8. Sol.
(a) 
\[ \lim_{{x \to \infty}} \frac{\sqrt{11x^4 + x - 7}}{2x^2 + 13} = \lim_{{x \to \infty}} \frac{\sqrt{x^4(11 + \frac{1}{x^3} - \frac{7}{x^7})}}{x^2(2 + \frac{13}{x^2})} \]
\[ = \lim_{{x \to \infty}} \frac{x^2\sqrt{11 + \frac{1}{x^3} - \frac{7}{x^7}}}{x^2(2 + \frac{13}{x^2})} \]
\[ = \lim_{{x \to \infty}} \frac{\sqrt{11 + \frac{1}{x^3} - \frac{7}{x^7}}}{2 + \frac{13}{x^2}} \]
\[ = \frac{\sqrt{11} + 0 - 0}{2 + 0} = \frac{\sqrt{11}}{2} \]

(b) 
\[ \lim_{{x \to -2}} \frac{3x^3 - 3}{x^2 + 4} = \left( \frac{3(-2)^3 - 3}{(-2)^2 + 4} \right)^{-1/3} = \left( \frac{-27}{8} \right)^{-1/3} = -\frac{2}{3} \]

(c) 
\[ \lim_{{x \to -4}} \frac{\frac{1}{x} + \frac{1}{x}}{4 + x} = \lim_{{x \to -4}} \frac{x + 4}{4 + x} = \lim_{{x \to -4}} \frac{x + 4}{4x(4 + x)} \]
\[ = \lim_{{x \to -4}} \frac{1}{4} = \frac{1}{4(-4)} = -\frac{1}{16} \]

(a) 
\[ f'(x) = \lim_{{h \to 0}} \frac{f(x + h) - f(x)}{h} = \lim_{{h \to 0}} \frac{[2(x + h)^2 + 3] - [2x^2 + 3]}{h} \]
\[ = \lim_{{h \to 0}} \frac{2(x + h)^2 + 3 - 2x^2 - 3}{h} = \lim_{{h \to 0}} \frac{2(x + h)^2 - 2x^2}{h} \]
\[ = \lim_{{h \to 0}} \frac{2(x^2 + 2hx + h^2) - 2x^2}{h} = \lim_{{h \to 0}} \frac{2x^2 + 4hx + 2h^2 - 2x^2}{h} \]
\[ = \lim_{{h \to 0}} \frac{4hx + 2h^2}{h} = \lim_{{h \to 0}} (4x + 2h) = 4x + 2(0) = 4x \]
(b) The slope of the tangent line to the graph of \( f \) at \((2, 11)\) is \( f'(2) = 4(2) = 8 \). So, the equation of the tangent line is \( y - 11 = 8(x - 2) \). 

10. Sol.
(a) Since 
\[
\lim_{x \to 0} \left(1 - \frac{x^2}{6}\right) = 1 - \frac{0^2}{6} = 1 \quad \text{and} \quad \lim_{x \to 0} 1 = 1,
\]
we have 
\[
\lim_{x \to 0} \frac{\sin x}{x} = 1
\]
(b) The Squeeze Theorem. 

11. Sol.
(a) The polynomial \( f(x) = x^3 - x - 2 \) is continuous everywhere on \((-\infty, \infty)\).
(b) Compute \( f(1) = 1^3 - 1 - 2 = -2, \quad f(2) = 2^3 - 2 - 2 = 4 \).

Since \( f(1) < 0 < f(2) \) and \( f(x) \) is continuous on \([1, 2]\), there is at least a \( c \) in the open interval \((1, 2)\) satisfying \( f(c) = 0 \) by the Intermediate Value Theorem.

(c) 

12. Sol. The function \( g(x) \) is continuous at \( x = c \) if the following three conditions hold simultaneously
(a) \( g(c) \) is defined.
(b) \( \lim_{x \to c^-} g(x) \) exists.
(c) \( \lim_{x \to c^+} g(x) = g(c) \)
Now, 
(a) \( g(c) = 14, \)
(b) 
\[
\lim_{x \to c^-} g(x) = \lim_{x \to c^-} (2x + b) = 2c + b
\]
and 
\[
\lim_{x \to c^+} g(x) = \lim_{x \to c^+} (x^3 - 13) = c^3 - 13.
\]
For \( g(x) \) to be continuous at \( x = c \), we must have 
\[
2c + b = 14, \quad c^3 - 13 = 14
\]
Solving these two equations, we obtain that \( c = 3, b = 8 \).
(a) $g(0) = \frac{1}{3}$
(b) $\lim_{x \to -\infty} g(x) = 0$
(c) $\lim_{x \to \infty} g(x) = \frac{1}{2}$
(d) $\lim_{x \to -3^-} g(x) = -\infty$
(e) $\lim_{x \to -3^+} g(x) = \infty$
(f) $\lim_{x \to -3^-} g(x)$ does not exist.
(g) $\lim_{x \to 4^-} g(x) = \infty$
(h) $\lim_{x \to 4^+} g(x) = \infty$
(i) $\lim_{x \to 4} g(x) = \infty$
(j) $y = 0$ and $y = 1/2$.
(k) $x = -3$ and $x = 4$. 