1. Ans:
   (a) Take path $y = mx$, limit does not exist.
   (b) Take path $y = mx$, limit does not exist.
   (c) Take path $x = my^2$, limit does not exist.
   (d) Put $x = r\cos\theta, y = r\sin\theta$, limit does not exist.
   (e) Take path $y = mx^2$, limit does not exist.
   (f) Take path $y = mx$, limit does not exist.
   (g) Take path $y = mx$, limit does not exist.
   (h) Put $x = r\cos\theta, y = r\sin\theta$; limit= 1.
   (i) limit =0.
   (j) Put $x = r\cos\theta, y = r\sin\theta$; limit =0.
   (k) Take path $x = mz^2, y = nz^2$; limit does not exist.
   (l) Take path $y = mx$, limit does not exist.
   (m) Put $xy - 2 = t$, limit=1/3.
   (n) Take path $y = x$ and $y = \sin x$, limit does not exist.
   (o) Take path $x = 1$ and $y = x - 1$, limit does not exist.
   (p) Put $x = r\cos\theta, y = r\sin\theta$; limit=1.
2. Use $\epsilon - \delta$ method.
3. Use $\epsilon - \delta$ method.
4. Ans
   (a) Put $x = r\cos\theta, y = r\sin\theta$; not continuous.
   (b) Put $x = r\cos\theta, y = r\sin\theta$; continuous.
   (c) Use $\epsilon - \delta$ method; continuous.
   (d) Take $\epsilon = \frac{1}{2}$; not continuous.
   (e) Put $x = r\cos\theta, y = r\sin\theta$; not continuous.
   (f) Put $x = r\cos\theta, y = r\sin\theta$; continuous.
   (g) Use $\epsilon - \delta$ method; continuous.

(h) Put $x = r\cos\theta, y = r\sin\theta$; continuous.

(i) Use $\epsilon - \delta$ method; continuous.

(j) Put $x = r\cos\theta, y = r\sin\theta$; not continuous.

(k) Use $\epsilon - \delta$ method; use $-1 \leq \sin x \leq 1$; continuous.

(l) Take path $x = 0$ and $y = 0$; not continuous.

5. $n < 1$

6. Ans:

(a) $c = 0$

(b) $c = 0$

(c) $c = 1$

(d) $c = 0$

(e) $c = 0$

(f) $c = -1$

(g) $c = 0$

(h) $c = 0$

7. Ans:

(a) Discontinuous along the line $1 + x + y = 0$.

(b) No points of discontinuity.

(c) No points of discontinuity.

8. Hint:

(a) Discontinuous for $x = m$ and $y = n,\ n, m \in \mathbb{Z}$.

(b) Discontinuous for $x = 0$ or $y = 0$.

9. Put $x = r\cos\theta$ and $y = r\sin\theta$; not possible.

10. Ans:

(i) limit=0.

(ii) Not continuous.