QUIZ 4 13.4, 14.1                                             (10 points)
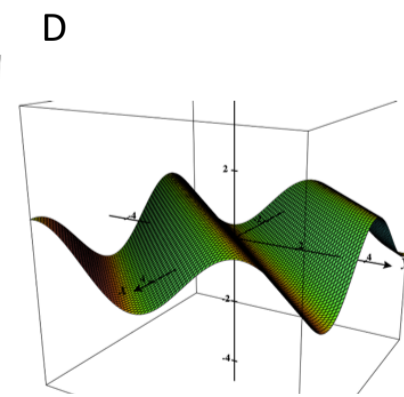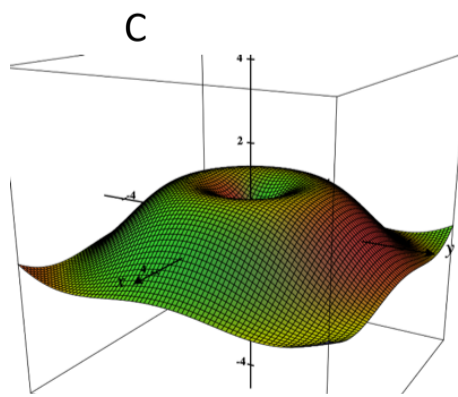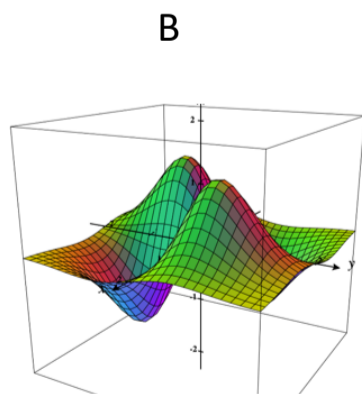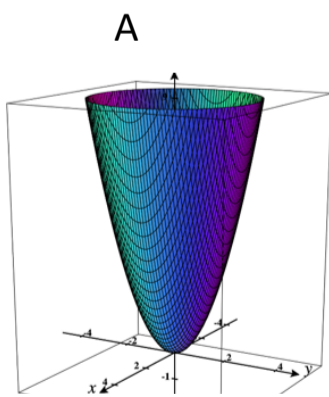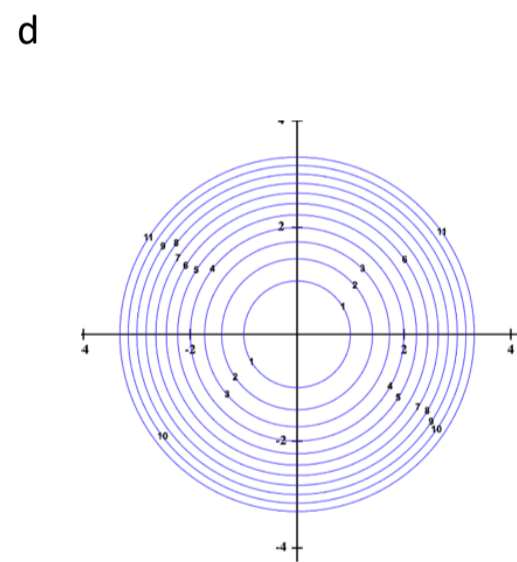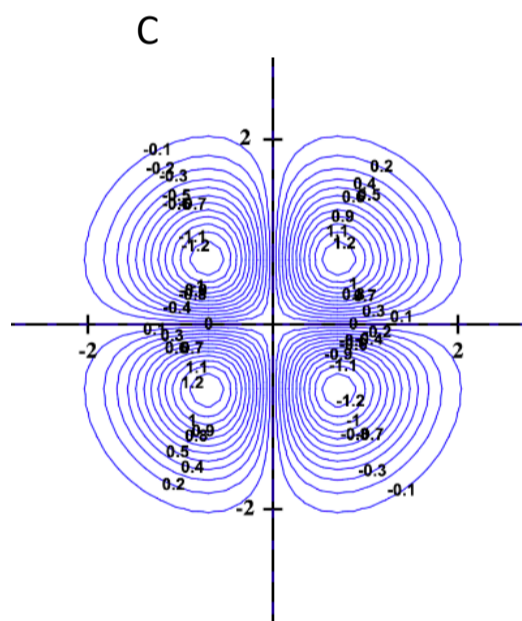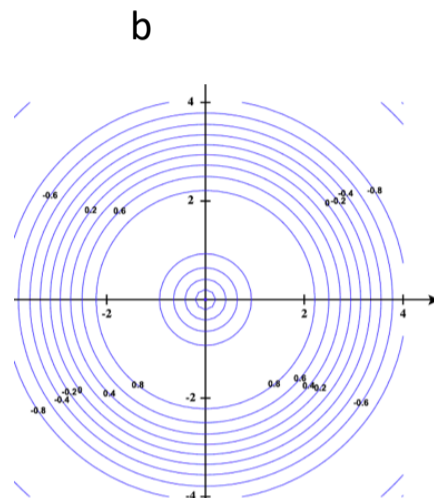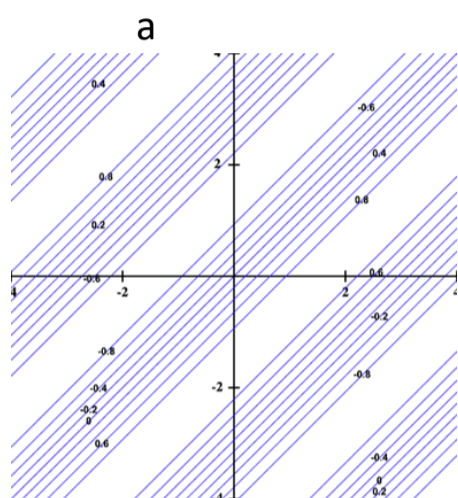
Match the following functions with their level curves (a-d) and their graphs (A-D)

(1)     $f(x,y) = \dfrac{7xy}{e^{x^2+y^2}}$    C    B        (2) $f(x,y) = \sin\sqrt{x^2+y^2}$   b   C
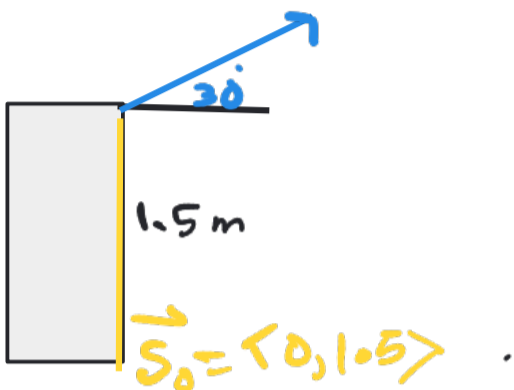
(3)     $f(x,y) = x^2 + y^2$     d    A        (4)   $f(x,y) = \sin(x-y)$    a    D

a



b



C



d



A



B



C



D

(5) An arrow is shot from a height of 1.5m, at an angle of 30 degrees above the horizontal with an initial speed of 100 m/sec. Find the range of the arrow.

$$\vec{V_0} = \langle 100\cos 30°, 100\sin 30° \rangle = \langle 50\sqrt{3}, 50 \rangle$$



$$\vec{S_0} = \langle 0, 1.5 \rangle$$

$$\vec{a} = -9.8\vec{j} = \langle 0, -9.8 \rangle$$

$$\vec{V} = \langle 0, -9.8t \rangle + \langle 50\sqrt{3}, 50 \rangle$$

$$\vec{V} = \langle 50\sqrt{3}, 50 - 9.8t \rangle$$

$$S = \langle 50\sqrt{3}\,t, 50t - 4.9t^2 \rangle + \vec{S_0}$$

$$S = \langle 50\sqrt{3}\,t, 50t - 4.9t^2 + 1.5 \rangle$$

**Range**  what is the x component when the y component is zero?

Hits ground $50t - 4.9t^2 + 1.5 = 0$

$$-4.9t^2 + 50t + 1.5 = 0$$

Time of impact $t = \dfrac{-50 \pm \sqrt{50^2 + 4.9(4)(1.5)}}{-4.9(2)}$

$$t = \dfrac{-50 \pm \sqrt{2500 + 29.4}}{-9.8} \approx 10.23 \text{ sec}$$

X component at impact;

$$50\sqrt{3}\,t \approx 886\,m$$