1. Multiple choice. Circle all that apply.

   (a) [3 pts] If a particle moves along a straight line, what can you say about its acceleration vector?

   (i) The acceleration vector is parallel to the tangent vector.

   (ii) The acceleration vector has magnitude equal to one.

   (iii) The acceleration vector equals the velocity vector.

   (iv) The acceleration vector is parallel to the unit normal vector.

   (v) The acceleration vector has a magnitude equal to zero.

   (b) [3 pts] If a particle moves with constant speed along a curve, what can you say about its acceleration vector?

   (i) The acceleration vector is parallel to the tangent vector.

   (ii) The acceleration vector has a magnitude of one.

   (iii) The acceleration vector equals the velocity vector.

   (iv) The acceleration vector is parallel to the unit normal vector.

   (v) The acceleration vector has a magnitude of zero.

2. [4 pts] Suppose the trajectory of a particle is parametrized by the curve

$$\mathbf{r}(t) = \langle 2e^t, e^{2t}, t\rangle, \quad -1 \le t \le 1.$$

Compute the distance traveled by the particle.

$\vec{r}\,'(t) = \langle 2e^t, 2e^{2t}, 1\rangle$

$\rightsquigarrow |\vec{r}\,'(t)| = \sqrt{4e^{2t} + 4e^{4t} + 1}$

$= \sqrt{(2e^{2t}+1)^2}$

$= 2e^{2t}+1$

Compute $L = \int_{-1}^{1} |\vec{r}\,'(t)|\,dt = \int_{-1}^{1} (2e^{2t}+1)\,dt$

$= e^{2t} + t \Big|_{-1}^{1}$

$= e^2 + 1 - (e^{-2} - 1)$

$= e^2 + e^{-2} + 2$ //

3. [6 pts] Match each of the six sets of level curves below with the appropriate function.

(a) $\cos(x) - \cos(y)$ d

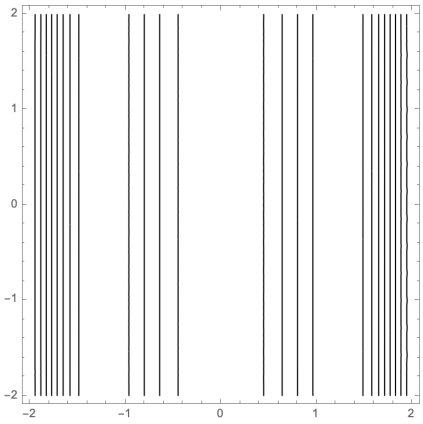
(b) $\sin(x^2)$ a

(c) $\dfrac{10x}{x^2+y^2}$ c

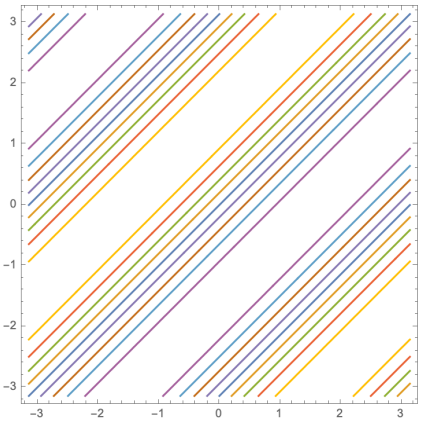
(d) $x\cos(y)$ e

(e) $\sin(y-x)$ b

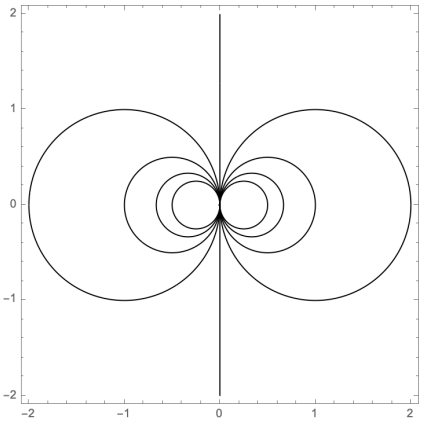
(f) $\cos(y-x)$ f



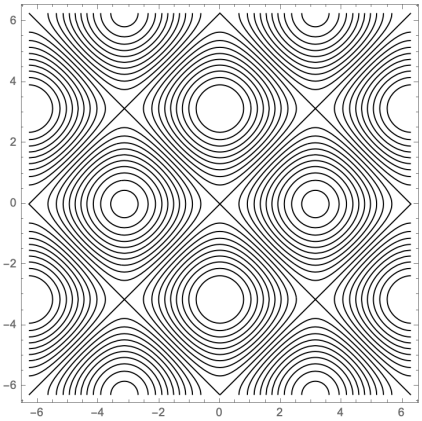
(a)



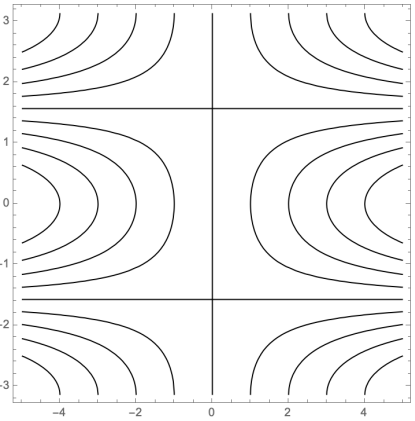
(b)



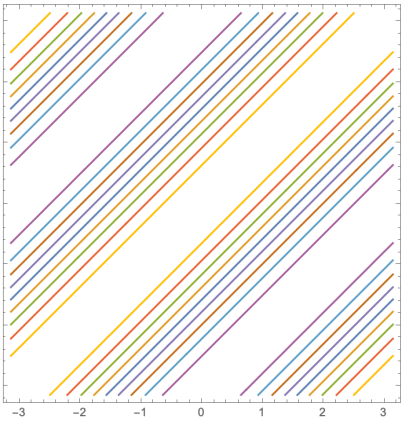
(c)



(d)



(e)



(f)