Please circle the most appropriate answer for each of the following problems. Each problem is worth ten points.

1. Find the polar coordinate representation of the rectangular coordinate point (0, 3).
   
   (a) (3, 0)
   (b) (3, π/2)
   (c) (3, π)
   (d) (3, −π/2)
   (e) none of the above.

   Note that if \((r, \theta) = (3, \pi/2)\) then
   \[
   x = r \cos \theta = 3 \cos \frac{\pi}{2} = 0
   \]
   \[
   y = r \sin \theta = 3 \sin \frac{\pi}{2} = 3.
   \]
2. Find a polar coordinate equation corresponding to the rectangular equation $y^2 - x^2 = 4$.

(a) $r = 4 \sin \theta$
(b) $r = 4 \cos \theta$
(c) $r = 4 \sec \theta$
(d) $r = 4 \csc \theta$
(e) none of the above.

\[
y^2 - x^2 = 4
\]
\[
(r \sin \theta)^2 - (r \cos \theta)^2 = 4
\]
\[
r^2 \sin^2 \theta - r^2 \cos^2 \theta = 4
\]
\[
r^2 (\sin^2 \theta - \cos^2 \theta) = 4
\]
\[
r^2 = \frac{4}{\sin^2 \theta - \cos^2 \theta}
\]
\[
= -\frac{4}{\cos^2 \theta - \sin^2 \theta}
\]
\[
= -\frac{4}{\cos(2\theta)}
\]
\[
= -4 \sec(2\theta)
\]
3. Find the arclength of the curve given in parametric form for \(-1 \leq t \leq 1\).

\[
x = t \cos t \\
y = t \sin t
\]

(a) 2.2596
(b) 2.2695
(c) 2.2956
(d) 2.2569
(e) none of the above.

\[
s = \int_{-1}^{1} \sqrt{(x'(t))^2 + (y'(t))^2} \, dt \\
= \int_{-1}^{1} \sqrt{(\cos t - t \sin t)^2 + (\sin t + t \cos t)^2} \, dt \\
= \int_{-1}^{1} \sqrt{\cos^2 t - 2t \cos t \sin t + t^2 \sin^2 t + 2t \cos t \sin t + t^2 \cos^2 t} \, dt \\
= \int_{-1}^{1} \sqrt{\cos^2 t + \sin^2 t + t^2(\cos^2 t + \sin^2 t) - 2t \cos t \sin t + 2t \cos t \sin t} \, dt \\
= \int_{-1}^{1} \sqrt{1 + t^2} \, dt \\
\approx 2.2956
\]
4. Find the equation in rectangular coordinates corresponding to the equation in polar coordinates \( r = \cos \theta \).

(a) \( x^2 - x - y^2 = 0 \)
(b) \( x^2 + x + y^2 = 0 \)
(c) \( x^2 + x - y^2 = 0 \)
(d) \( x^2 - x + y^2 = 0 \)
(e) none of the above.

\[
\begin{align*}
  r &= \cos \theta \\
r^2 &= r \cos \theta \\
x^2 + y^2 &= x \\
x^2 - x + y^2 &= 0
\end{align*}
\]