1. I will be working on short answer questions for Wiley-Plus, which should closely resemble the assignments we covered in class for Assignment 1 and 2. I will provide you with more details about this section during the lecture on May 30th.

2. (a) Let $r^2 = \sin\theta$ be a polar equation. Find a point (r, θ) other than $(0, 0)$ which lies on the polar curve.

   Answer ________________

   (b) Write the Cartesian coordinates $(-3, -\sqrt{3})$ as polar coordinates.

   Answer ________________

   (c) Let $\vec{u} = \vec{i} + \vec{j}$, and let $\vec{v} = \vec{j} - \vec{i}$. Then $\vec{u} \times \vec{v}$ is:

   Answer ________________

   (d) Let $\vec{r}(t) = \langle\ t^2,\ e^{-3t},\ \cos^2 t\ \rangle$. Calculate $\vec{r}\,''(t)$.

   Answer ________________

3. Find the parametric equation of the lines.

   (a) The line through $(-8, 0, 2)$ and $(3, -2, 4)$.

   (b) A line through the origin and perpendicular to the vector $(1, 5, 2)$

4. Match each equation with its graph. Write **A, B, C** or **D** for each equation. Only your final answer will be graded. Each part is worth 1 mark.

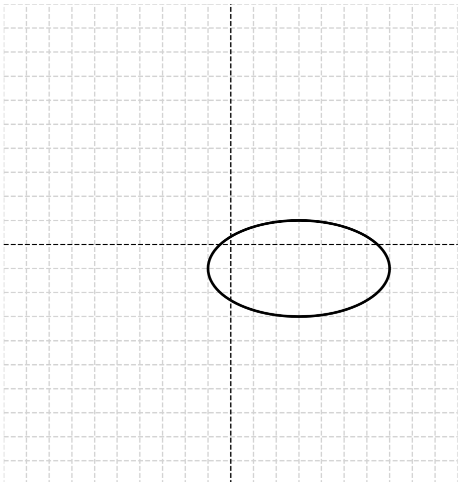
   (a) $x^2 + 4y^2 - 6x + 8y = 3$ Answer ________

   (b) $4x^2 + 8x + (y - 3)^2 = 12$ Answer ________

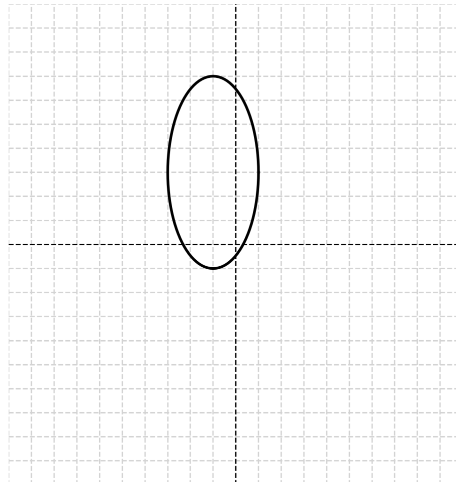
   (c) $2y + x^2 = 2x + 5$ Answer ________

   (d) $2x + 7 = y^2 + 2y$ Answer ________

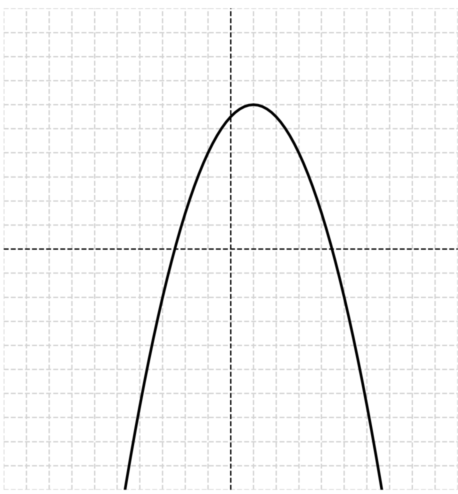
A



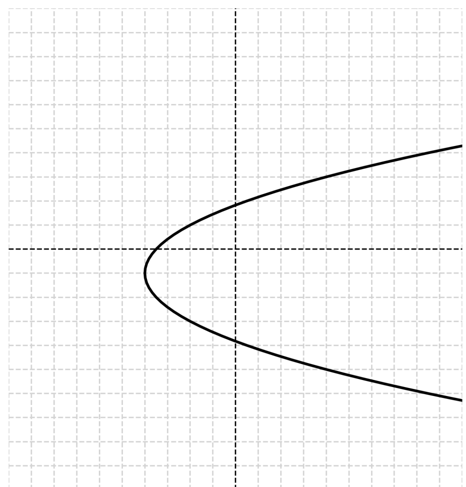
B



C



D



5. A curve is parametrized by $x(t) = t^2 - 3, y(t) = t^3 - 4t$ for $-2 \leq t \leq 2$.

   (a) Give an expression for $\frac{dy}{dx}$ in terms of t.

   (b) Find all points (x, y) at which the curve has a horizontal or vertical tangent line.

6. Sketch the polar curve $r = \cos(2\theta)$ for $0 \leq \theta \leq \pi$ and indicate any horizontal and vertical tangent lines, if they exist.

7. Let C be the curve of intersection of the following surfaces:

$$x^2 + y^2 + z^2 = 2 \text{ and } z = \sqrt{x^2 + y^2}.$$

   Find a vector function $\vec{r}(t)$ that represents C.

8. Find the limit if it exists, or show that the limit does not exist.

   (a)
$$\lim_{(x,y)\to(0,0)} (x^2+y^2)\cos\left(\frac{1}{\sqrt{x^3+y^3}}\right).$$

   (b)
$$\lim_{(x,y)\to(1,1)} \frac{y-x}{1-y+\ln(x)}.$$

9. Let $f\colon \mathbb{R}^2 \to \mathbb{R}$ be the function given by

$$f(x,y) = \begin{cases} \frac{x^4}{x^2+y^2} + 2x + 3y & \text{if } (x,y) \neq (0,0) \\ \\ 0 & \text{if } (x,y) = (0,0). \end{cases}$$

Check if $f(x,y)$ is continuous around the neighbourhood of the point $(0,0)$

10. Let $f(x,y) = \frac{x^2}{y}$. Find the total derivative of $f(x,y)$ and $f_{xy}(-1,1)$.