MATH 100, Fall 2021
Tutorial Worksheet
Tutorial Section (T01, T02 etc)_____
Tutorial Instructor Name:_____
Question Number Attempted (Q1, Q2, etc) Q1

Your Name: KEY
Your Student Number: V00_____
Today's Date:_____

Question Attempted: Q 1

1 Turn = 400 Gradians = 360° = 2π radians.

Let sin denote sin in radians. Then 1 Gradian = $\frac{2\pi}{400} = \frac{\pi}{200}$ rad

Then $\boxed{\sin_G(x) = \sin\left(\frac{\pi}{200}x\right)}$.

Taking the derivative, we obtain

$$\frac{d}{dx}\sin_G(x) = \frac{d}{dx}\left(\sin\left(\frac{\pi x}{200}\right)\right) = \frac{\pi}{200}\cos\left(\frac{\pi x}{200}\right)$$

$$\boxed{= \frac{\pi}{200}\cos_G(x)}$$

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Tutorial Worksheet
Tutorial Section (T01, T02 etc)_____
Tutorial Instructor Name:_____
Question Number Attempted (Q1, Q2, etc) Q2

Your Name: Key
Your Student Number: V00_____
Today's Date:_____

Question Attempted: Q2

If $x^4+2x^2-y^2=-1$, then differentiating both sides we obtain

$$\frac{d}{dx}\left(x^4+2x^2-y^2\right) = 4x^3+4x-2yy' = \frac{d}{dx}(-1) = 0.$$

Rearranging, we obtain $\boxed{y' = \frac{2x^3+2x}{y} = \frac{2x(x^2+1)}{y}}$.

Then at $(x,y)=(-1,-2)$, $y' = \frac{-2(2)}{-2} = 2$.

Then $y = 2x+C$, and substituting in $(x,y)=(-1,-2)$, we find $C = -2+2=0$, so the eqn of the tangent is

$$\boxed{y=2x}.$$

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Tutorial Worksheet
Tutorial Section (T01, T02 etc)_____
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Question Number Attempted (Q1, Q2, etc) Q3

Your Name: KEY
Your Student Number: V00_____
Today's Date:_____

Question Attempted: Q3

Given $x^4+2x^2-y^2=-1$, we may rearrange

to find $y^2 = x^4+2x^2+1 = (x^2+1)^2$.

Then if $y<0$, we may conclude $y = -\sqrt{(x^2+1)^2} = -(x^2+1)$

Then $\boxed{y' = -2x}$.

Then at $x=-1$, $y'=2$. Thus the tangent

to the curve at $(-1,-2)$ may be given by $y=2x+C$.

Subbing in $(-1,-2)$ we find $-2=-2+C$ so $C=0$.

Finally, the formula for the tangent is then given by

$$\boxed{y=2x}.$$

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Tutorial Worksheet
Tutorial Section (T01, T02 etc)_____
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Question Number Attempted (Q1, Q2, etc) Q4

Your Name: KEY
Your Student Number: V00_____
Today's Date:_____

Question Attempted: Q4

Here $x(\theta) = \cos\theta$, $\theta(t) = 2t + \frac{1}{2}t^2$.

Then $\frac{dx}{d\theta} = -\sin\theta$, $\frac{d\theta}{dt} = 2+t$.

We have shown that $\frac{dx}{dt} = \frac{dx}{d\theta}\frac{d\theta}{dt} = (-\sin\theta)(2+t)$

$= -(2+t)\sin\left(2t + \frac{1}{2}t^2\right)$.

For time -3, we get

$$\left.\frac{dx}{dt}\right|_{t=-3} = -(2-3)\sin\left(-3 + \frac{9}{2}\right) = \sin\left(-\frac{3}{2}\right) < 0,$$

Therefore, the coordinate is moving in the negative direction at this time.

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Tutorial Worksheet
Tutorial Section (T01, T02 etc)_____
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Question Number Attempted (Q1, Q2, etc) Q5

Your Name: KEY
Your Student Number: V00_____
Today's Date:_____

Question Attempted: Q5

$$y = \frac{x^2(x+3)^6 e^{-3x}}{(x^2+1)^{\frac{1}{4}}}, \text{ so}$$

$$y' = y\frac{d}{dx}\ln(y) = y\frac{d}{dx}\left(2\ln x + 6\ln(x+3) - 3x - \frac{1}{4}\ln(x^2+1)\right)$$

$$= y\left(\frac{2}{x} + \frac{6}{x+3} - 3 - \frac{2x}{4(x^2+1)}\right)$$

$$= \frac{x^2(x+3)^6 e^{-3x}}{(x^2+1)^{\frac{1}{4}}}\left(\frac{2}{x} + \frac{6}{x+3} - 3 - \frac{x}{2(x^2+1)}\right)$$