Help session #2 (Trig unit) Calc AB

1) Curve sketch: $f(x) = x + 2\cos x$ $[-\pi, \pi]$

$f'(x) = 1 - 2\sin x$

$0 = 1 - 2\sin x$ | $2\sin x = 1$ | $\sin x = 1/2$

$x = \pi/6, 5\pi/6, -12\pi/6, -12\pi/6$

~~$-11\pi/6$~~ ~~$-7\pi/6$~~

$f'(x)$ + − +

$-\pi$ 0 $\pi/6$ $\pi/2$ $5\pi/6$ π

$f'(0) = 1 - 2\sin 0 =$

$f'(\pi/2) = 1 - 2\sin(\pi/2) =$

$f''(x) = -2\cos x$

$-2\cos x = 0$

$\cos x = \frac{0}{-2} = 0$

$\cos x = 0$

$x = \pi/2, \cancel{3\pi/2}, -\pi/2, \cancel{-3\pi/2}$

$f''(x)$ ∪ + ∩ − ∪ +

$-\pi$ $(-3\pi/4)$ $-\pi/2$ (0) $\pi/2$ $(3\pi/4)$ π

$f''(-3\pi/4) = -2\cos(-3\pi/4)$

$= -2\cos(5\pi/4)$

$f''(3\pi/4) = -2\cos(3\pi/4)$

16) $f(x) = x + 2\cos x \qquad [-\pi, \pi]$

$\sqrt{3} = 1.7$
$\sqrt{2} = 1.2$

$f(-\pi) = -\pi + 2\cos(-\pi) \simeq -5 \qquad f(\pi) = \pi + 2\cos(\pi) = 1$

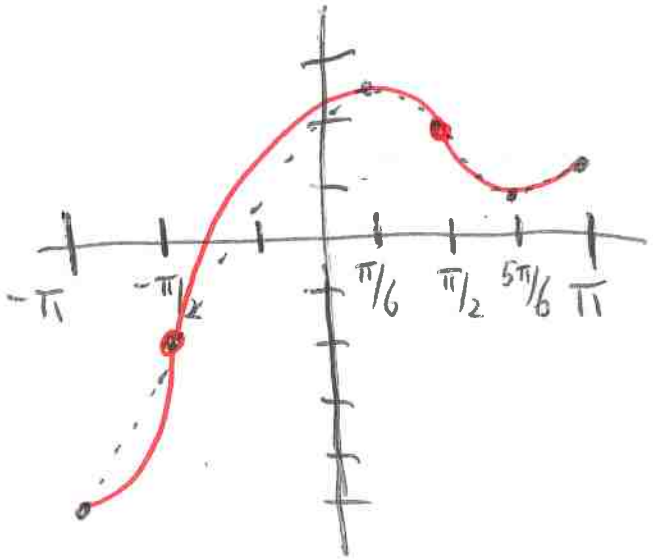
$f(\pi/6) = \frac{\pi}{6} + 2\cos(\pi/6) = 0.5 + 2\left(\frac{\sqrt{3}}{2}\right) \simeq 0.5 + 1.7 \simeq 2.2$

$f(5\pi/6) = \frac{5\pi}{6} + 2\cos(5\pi/6) = 2.5 - 2\left(\frac{\sqrt{3}}{2}\right) = 2.5 - 1.7 = 0.8$

$f(-\pi/2) = -\pi/2 + 2\cos(-\pi/2) = -1.5 + 0 = -1.5$

$f(\pi/2) = \pi/2 + 2\cos(\pi/2) = 1.5$

$f(x)$



Abs max: $y = 2.2$

Abs min: $y \simeq -5$

2) $f(x) = \overbrace{x^2}^{f}\overbrace{\arccos(5-x^2)}^{g} - e^{x^2-3x}$

* product Rule

$\frac{d}{dx}\arccos u = \frac{-u'}{\sqrt{1-u^2}}$

$\frac{d}{dx}e^u = e^u \cdot u'$

$f'(x) = \overbrace{(2x)}^{f'}\overbrace{(\arccos(5-x^2)}^{g} + \overbrace{x^2}^{f}\cdot\overbrace{\frac{-(-2x)}{\sqrt{1-(5-x^2)^2}}}^{g'} - e^{x^2-3x}\cdot(2x-3)$

$$f'(x) = 2x\arccos(5-x^2) + \frac{2x^3}{\sqrt{1-(5-x^2)^2}} - (2x-3)e^{x^2-3x}$$

3) Find $\frac{dy}{dx}$ $\overbrace{y^2}^{f}\overbrace{\cot(2y)}^{g} - 3x^2 = y + 4$

* product Rule
* implicit
* trig derivatives

$\overbrace{2y\left(\frac{dy}{dx}\right)}^{f'}\overbrace{\cot(2y)}^{g} + \overbrace{y^2}^{f}\cdot\overbrace{-\csc^2(2y)\left(2\left(\frac{dy}{dx}\right)\right)}^{g'} - 6x = 1\left(\frac{dy}{dx}\right) + 0$

$\frac{dy}{dx}2y\cot(2y) - 2y^2\csc^2(2y)\left(\frac{dy}{dx}\right) - 1\left(\frac{dy}{dx}\right) = 6x$

$\frac{dy}{dx}\left(2y\cot(2y) - 2y^2\csc^2(2y) - 1\right) = 6x$

$$\frac{dy}{dx} = \frac{6x}{2y\cot(2y) - 2y^2\csc^2(2y) - 1}$$