WRITING Assignment #3

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1.) Given the function $f(x) = ax^3 + bx^2 + cx + d$
we can differentiate $f(x)$ to receive $f'(x) = 3ax^2 + 2bx + C$

- Using these as well as the two points $(-2,6), (2,0)$
we can create a system of equations by plugging into $f'(x)$ and $f(x)$ then simplifying

$-8a - 2c + d = 6$

$8a + 2c + d = 0$

$12a + c = 0$

$12a + C = 0$

We're using points with horizontal tangents so the rate of change must $= 0$

- Solving this gives us the results $a = \frac{3}{16}$, $b = 0$, $C = \frac{-9}{4}$, and $d = 3$ and the resultant function

$$f(x) = \frac{3}{16}x^3 - \frac{9}{4}x + 3$$

2.) Given $F = \dfrac{\mu W}{\mu \sin\theta + \cos\theta}$

a) We can differentiate this function using the toolbox of derivative rules

$$F' = \frac{((\mu\sin\theta + \cos\theta)\cdot 0) - \mu W(\mu\cos\theta - \sin\theta)}{(\mu\sin\theta + \cos\theta)^2}$$

$$F' = \frac{\mu W(\sin\theta - \mu\cos\theta)}{(\mu\sin\theta + \cos\theta)^2}$$

2b.) Since we know that if the rate of change is 0 then the derivative of F must equal 0

So... $F' = \dfrac{\mu W(\sin\theta - \mu\cos\theta)}{(\mu\sin\theta + \cos\theta)^2} = 0$

Since the denominator cannot be 0 then.. $\mu W(\sin\theta + \mu\cos\theta) = 0$ and since μW are constants we assume that μW is not 0.

Therefore.. $\sin\theta - \mu\cos\theta = 0$

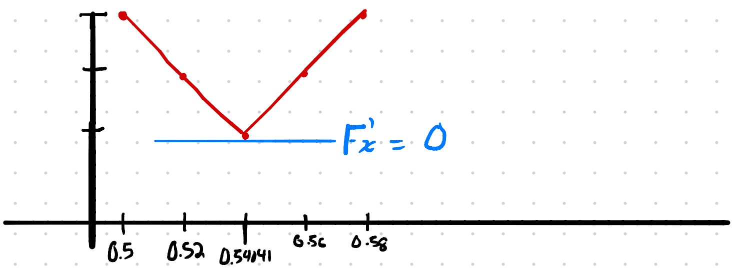
$$\sin\theta = \mu\cos\theta$$

$$\mu = \frac{\sin\theta}{\cos\theta} = \tan\theta$$

- So when $\theta = \arctan(\mu)$ F has a rate of change equal to 0

2c.) By plugging in multiple values of θ approaching $\arctan(\mu) = 0.54041$

θ	F
0.5	25.75
0.52	25.73
0.54041	25.72
0.56	25.73
0.58	25.75



This proves the notion setforth in 2b. that $F' = 0$ at $\theta = \arctan\mu$