HW 12 MATH 2501 FALL 2018

§4.9 $f(x) = \sin(x) \longrightarrow f'(x) = \cos(x)$

#408 $x_{n+1} = x_{n-1} - \frac{f(x_{n-1})}{f'(x_{n-1})}$

$$\downarrow$$

$$x_n = x_{n-1} - \frac{\sin(x_{n-1})}{\cos(x_{n-1})}$$

#414 $x_{n+1} = x_n^2 - \frac{1}{2}$

a) $x_0 = 0.6$

$x_1 = x_0^2 - \frac{1}{2} = (0.6)^2 - \frac{1}{2} = -0.14$

$x_2 = (-0.14)^2 - \frac{1}{2} = -0.4804$

b) $x_0 = 2$

$x_1 = x_0^2 - \frac{1}{2} = 2^2 - \frac{1}{2} = 3.5$

$x_2 = 3.5^2 - \frac{1}{2} = 11.75$

Problem 427, Section 4.9			x_{n+1}=x_n-f(x_n)/f'(x_n)=x_n-(x+tan(x_n))/(1+sec^2(x_n))
n=	x_n=		
0	-0.3		
1	-0.00924298680		
2	-0.00000026322		
3	0		
4	0		
5	0		
6	0		
7	0		
8	0		
9	0		
10	0		
11	0		
12	0		
13	0		
14	0		
15	0		
16	0		
17	0		
18	0		
19	0		
20	0		
21	0		
22	0		
23	0		
24	0		
25	0		
26	0		

Problem 460, Section 4.9			f(E)=(pi/3)-E+0.25*sin(E)
n=	x_n=		f'(E)=-1+0.25*cos(E)
0	0.1		
1	1.394052916		x_{n+1}=x_n-f(x_n)/f'(x_n)=x_n-(pi/3-x_n+0.25*sin(x_n))/(-1+0.25*cos(x_n))
2	1.28867073		
3	1.287212522		
4	1.287212248		
5	1.287212248		
6	1.287212248		
7	1.287212248		
8	1.287212248		
9	1.287212248		
10	1.287212248		
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27	1.287212248		
28	1.287212248		
29	1.287212248		

§4.10 #470 $D^{-1}\left[\frac{1}{x^2}+x\right] = D^{-1}\left[x^{-2}+x\right]$

$= \frac{x^{-1}}{-1} + \frac{x^2}{2} + C$

$= -\frac{1}{x} + \frac{x^2}{2} + C$

#472 $D^{-1}\left[e^x + 3x - x^2\right] = e^x + \frac{3}{2}x^2 - \frac{1}{3}x^3 + C$

#476 $D^{-1}\left[\frac{1}{\sqrt{x}}\right] = D^{-1}\left[x^{-1/2}\right] = \frac{x^{1/2}}{1/2} + C = 2\sqrt{x} + C$

#500 $f'(x) = \sqrt{x} + x^2$, $f(0) = 2$

$\downarrow$

$f(x) = D^{-1}[f'(x)] = D^{-1}\left[x^{1/2} + x^2\right]$

$= \frac{x^{3/2}}{3/2} + \frac{x^3}{3} + C$

$= \frac{2}{3}x^{3/2} + \frac{1}{3}x^3 + C$

Now apply initial condition

$\underbrace{2}_{\text{given}} = f(0) = \underbrace{\frac{2}{3}(0) + \frac{1}{3}(0) + C}_{\text{calculated}}$

$\Downarrow$

$2 = C$

Therefore, $f(x) = \frac{2}{3}x^{3/2} + \frac{1}{3}x^3 + 2$

#504 $f''(x) = x^2+2$

$f'(x) = D^{-1}(f''(x)) = \frac{x^3}{3} + 2x + C$

$f(x) = D^{-1}(f'(x)) = \frac{x^4}{12} + x^2 + Cx + E$

Two possible functions whose second derivative is x^2+2:

choose $C=1=E$ $\longrightarrow$ $f(x) = \frac{1}{12}x^4 + x^2 + x + 1$

and

choose $C=0, E=10$ $\longrightarrow$ $f(x) = \frac{1}{12}x^4 + x^2 + 10$