

1.

(a), $f(x) = x^2 - 4, f'(x) = 2x, x_0 = 1$

$$x_{k+1} = x_k - \frac{f(x_k)}{f'(x_k)}$$

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = x_0 - \frac{x_0^2 - 4}{2x_0} = 1 + \frac{3}{2} = \frac{5}{2}$$

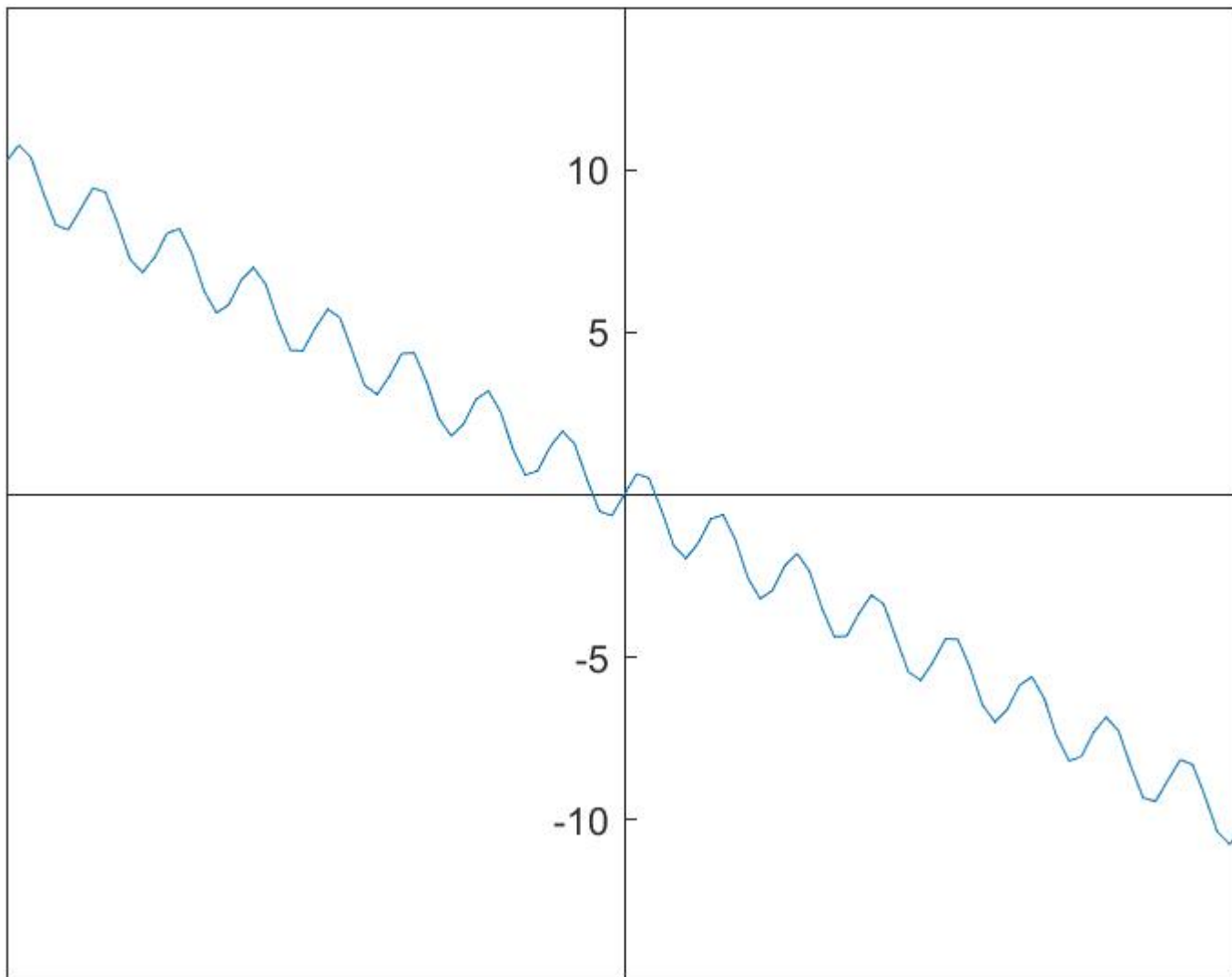
(b) $f(x) = x^2 - 4, x_0 = 1, x_1 = 3, f(x_0) = -3, f(x_1) = 5,$

$$x_{k+1} = x_k - f(x_k) \frac{x_k - x_{k-1}}{f(x_k) - f(x_{k-1})}$$

$$x_2 = x_1 - f(x_1) \frac{x_1 - x_0}{f(x_1) - f(x_0)} = 3 - 5 \frac{3-1}{5+3} = 3 - \frac{5}{4} = 1.75$$

2.

(a) 3개의 근을 가진다



(b)
경우1. 0를 근으로 갖는다

MATLAB R2022a - academic use

파일 편집기 퍼블리시 보기

새로 만들기 열기 저장 인쇄

이동 찾기

리팩터링

프로파일러

섹션 나누기

실행 및 진행

실행 스텝 중지

파일

탐색 코드 분석

실행

현재 폴더

이름 *

IndividualWork-5.pdf

HWS_prob2_b.m

HWS_prob2_a.m

1.hwp

HWS_prob2_b.m (스크립트)

fnc_newton_f(x)

명령 창

```
221.976766 -442.980425 -4.303580 102.932997  
119.043768 -237.863522 -11.745858 20.250843  
98.792925 -196.591011 -0.985363 199.511237  
-100.718312 200.482080 -4.980722 -40.251614  
-60.466698 119.937408 -1.105123 -108.528562  
48.061864 -96.078712 -11.989862 8.013329  
40.048535 -81.094779 -2.676591 30.297790  
9.750745 -19.619297 -11.930365 1.644484  
8.106261 -16.792578 6.145755 -2.732382  
10.838643 -20.677288 -2.014867 10.262358  
0.576285 -1.649740 6.676532 -0.247095  
0.823381 -0.718031 -5.707565 0.125803  
0.697577 -0.756625 5.695973 -0.132835  
0.830412 -0.760438 -6.350917 0.119737  
0.710675 -0.687775 4.796075 -0.143404  
0.854079 -0.934885 -8.340733 0.112087  
0.741992 -0.576718 2.205556 -0.261484  
1.003477 -2.579811 -10.196547 0.253008  
0.750468 -0.561324 1.422387 -0.394635  
1.145103 -3.188266 2.398732 -1.329147  
2.474250 -5.328912 7.248168 -0.735208  
3.209458 -5.791170 5.784184 -1.001208  
4.210666 -9.375226 -5.001428 1.874510  
2.336156 -5.652302 -3.990474 1.416449  
0.919707 -1.613673 -11.741871 0.137429  
0.782278 -0.565043 -1.688076 0.334726  
0.447552 -1.867182 -4.346593 0.429574  
0.017978 0.142861 7.838823 0.018225  
-0.000246 -0.001970 7.999970 -0.000246  
0.000000 0.000000 8.000000 0.000000
```

변수 - y

```
1 clearvars; clc;  
2 x=5;  
3 tol=1e-6; ErrorValue=tol+1;  
4 disp(' x y dy/dx h');  
5 while ErrorValue > tol  
6 % compute function values  
7 [y,yp]=fnc_newton_f(x);  
8 newx=x-y/yp;  
9 % show results  
10 fprintf(' %1.6f %1.6f %1.6f %1.6f\n',x,y,yp,y/yp);  
11 % compute error  
12 ErrorValue=abs(newx-x);  
13 % update x  
14 x=newx;  
15 end  
16  
17 function [y,yp]=fnc_newton_f(x)  
18 y=sin(10*x)-2*x;  
19 yp=10*cos(10*x)-2;  
20 end  
21
```

작업 공간

이름	값
ErrorValue	6.2263e-10
newx	0
tol	1.0000e-06
x	0
y	4.9810e-09
yp	8

Zoom: 90% UTF-8 CRLF 스크립트 라인 8 열 20

경우2. 0.259574를 근으로 갖는다.

MATLAB R2022a - academic use

파일 편집기 퍼블리시 보기

새로 만들기 열기 저장 인쇄

이동 찾기

리팩터링

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파일

탐색 코드 분석

실행

현재 폴더

이름 *

IndividualWork-5.pdf

HWS_prob4.m

HWS_prob3_a.m

HWS_prob2_b.m

HWS_prob2_a.m

HWS_2015251026.김진우.hwp

HWS_prob2_b.m (스크립트)

fnc_newton_f(x)

명령 창

```
1327.181647 -3034.872772 -10.004836 288.069112  
1239.117535 -2477.565282 5.425529 -456.649547  
1695.767082 -3392.136423 5.983004 -566.962095  
2262.729177 -4524.458784 -1.706854 2650.758430  
-388.029253 776.471377 -11.107896 -69.902651  
-318.126602 635.333497 -5.926043 -107.210405  
-210.916197 422.746501 -6.054734 -69.820817  
-141.095380 282.560470 -11.291470 -25.024242  
-116.071138 233.136546 -3.068984 -75.965384  
-40.105755 81.086934 2.833545 28.616780  
-68.722535 136.739347 -9.084884 -15.051303  
-53.671232 106.863012 -10.775688 -9.917048  
-43.754184 88.266511 -8.520881 -10.358848  
-33.395336 65.980446 3.861183 17.088142  
-50.483478 100.146826 -7.721776 -12.969404  
-37.514074 75.989320 -4.759509 -15.965791  
-21.548283 42.136551 -4.799450 -8.779454  
-12.768830 24.638870 -6.383796 -3.859595  
-8.909234 16.915019 2.286941 7.396350  
-16.305585 32.913343 7.532529 4.369495  
-20.675079 41.910107 6.285276 6.667982  
-27.343061 54.797938 -11.937290 -4.590484  
-22.752577 44.533744 0.374080 119.048599  
-141.801176 284.516532 -6.053104 -47.003413  
-94.797763 190.301182 5.085547 37.420002  
-132.217765 264.016065 -11.077715 -23.833081  
-108.384685 216.766750 -11.999966 -18.063947  
-90.320737 181.641474 -2.005165 -90.586800  
0.266063 -0.069489 -10.865482 0.006395  
0.259667 -0.000984 -10.551686 0.000093  
0.259574 -0.000000 -10.546846 0.000000
```

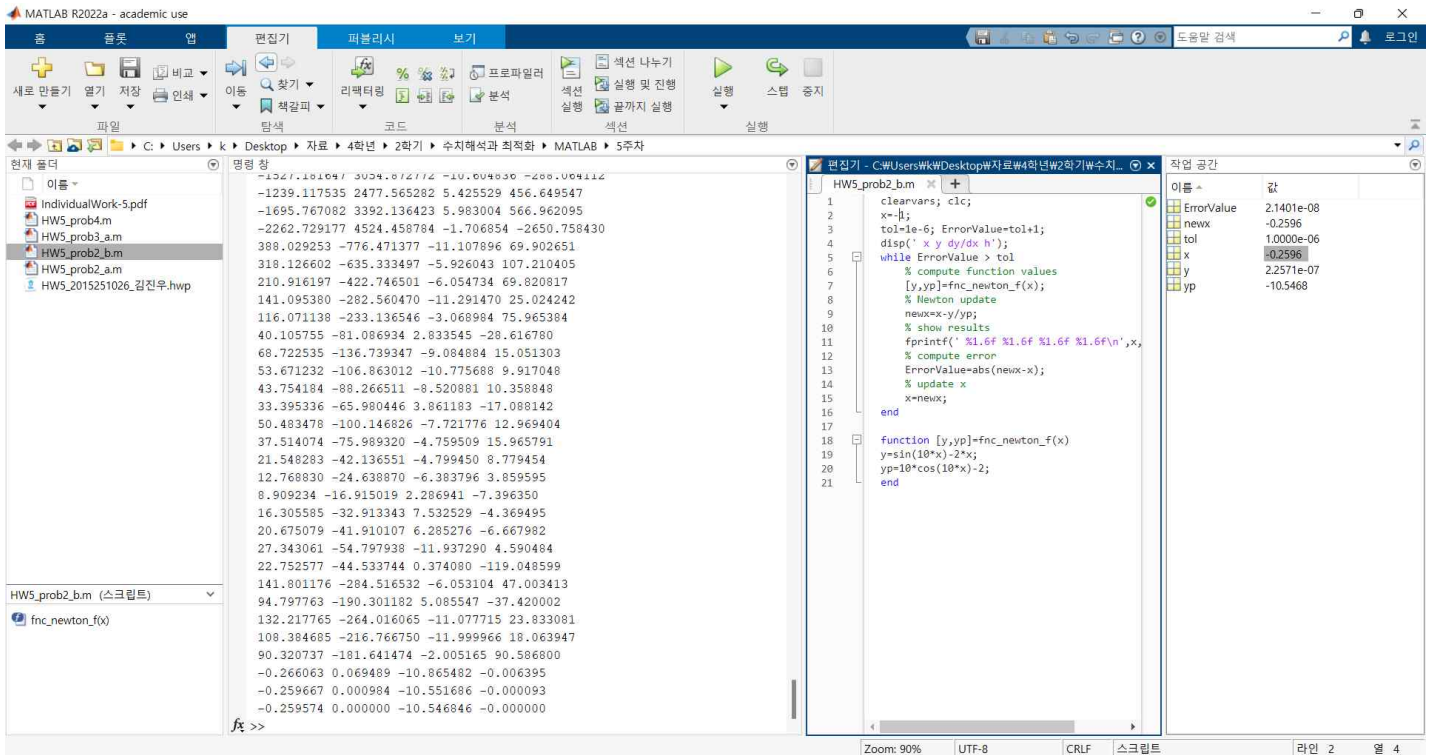
변수 - y

```
1 clearvars; clc;  
2 x=1;  
3 tol=1e-6; ErrorValue=tol+1;  
4 disp(' x y dy/dx h');  
5 while ErrorValue > tol  
6 % compute function values  
7 [y,yp]=fnc_newton_f(x);  
8 newx=x-y/yp;  
9 % show results  
10 fprintf(' %1.6f %1.6f %1.6f %1.6f\n',x,y,yp,y/yp);  
11 % compute error  
12 ErrorValue=abs(newx-x);  
13 % update x  
14 x=newx;  
15 end  
16  
17 function [y,yp]=fnc_newton_f(x)  
18 y=sin(10*x)-2*x;  
19 yp=10*cos(10*x)-2;  
20 end  
21
```

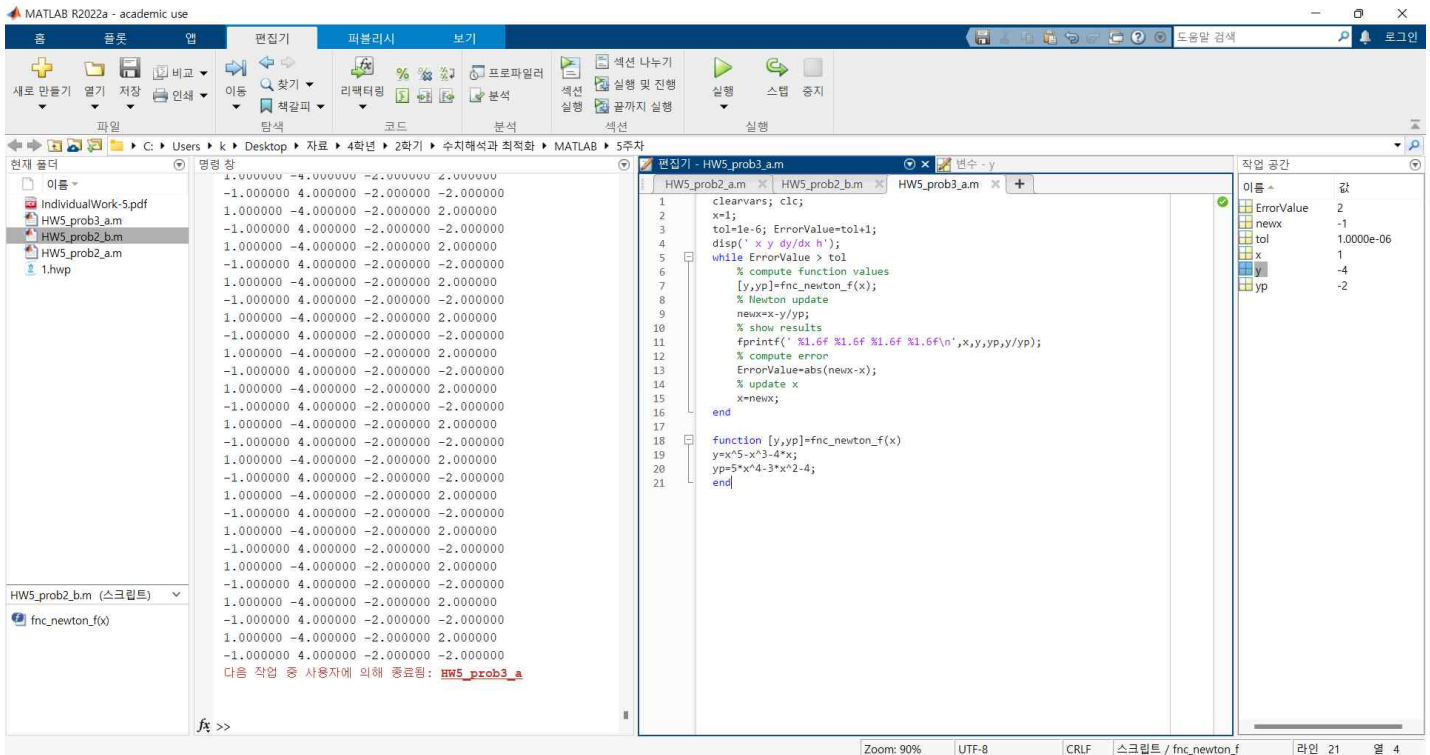
작업 공간

이름	값
ErrorValue	2.1401e-08
newx	0.2596
tol	1.0000e-06
x	0.2596
y	-2.2571e-07
yp	-10.5468

경우3. -0.259574를 근으로 갖는다.



3.
(a) 발산한다.

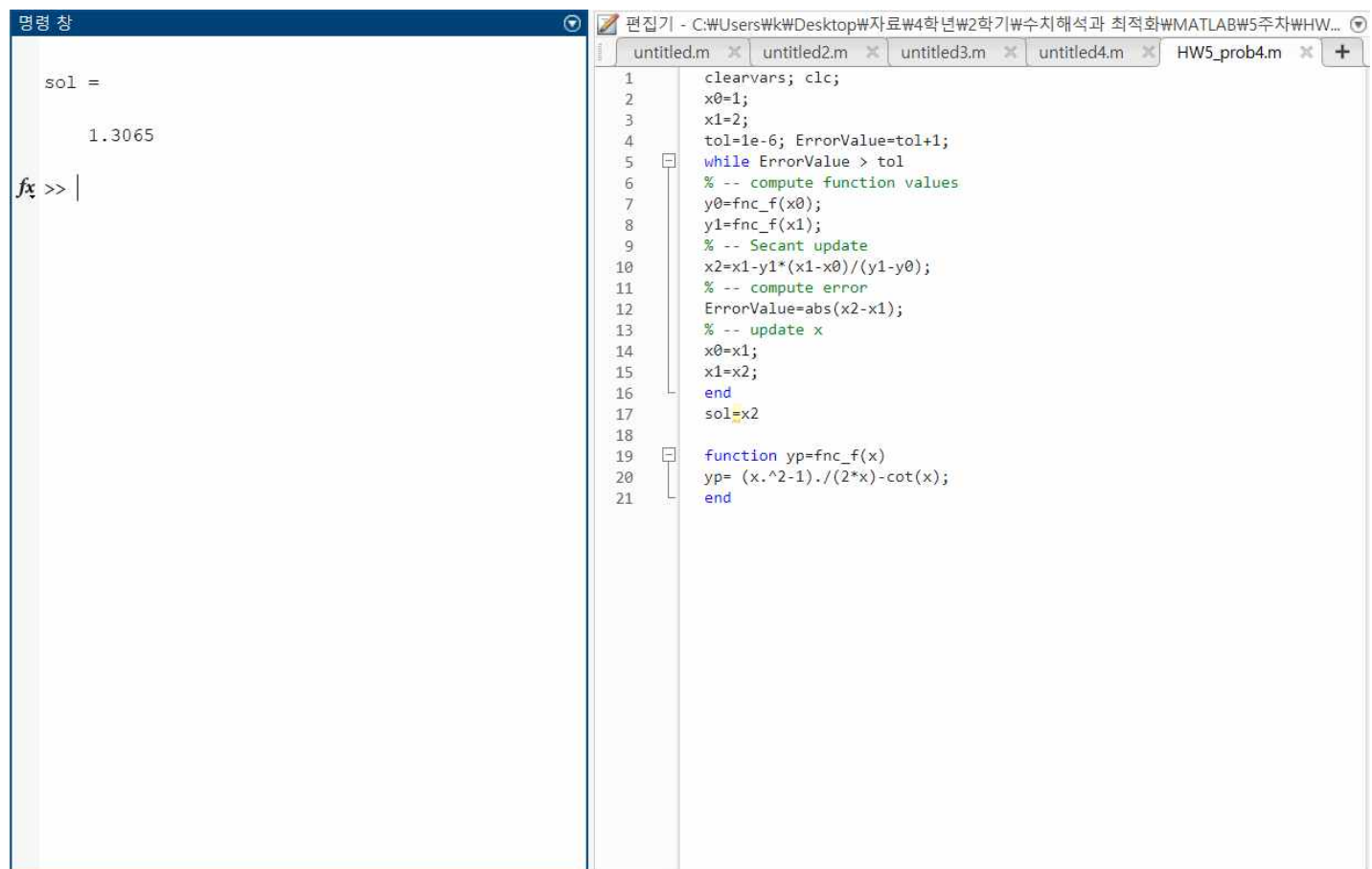


$$(b) \quad x^5 - x^3 - 4x = x(x^4 - x^2 - 4) = x(x^2 - \frac{1 + \sqrt{17}}{2})(x^2 + \frac{\sqrt{17} - 1}{2}) = x(x \pm \sqrt{\frac{1 + \sqrt{17}}{2}})(x \pm \sqrt{\frac{\sqrt{17} - 1}{2}} i) = 0$$

$$x = 0, \pm \sqrt{\frac{1 \pm \sqrt{17}}{2}}, \pm \sqrt{\frac{\sqrt{17} - 1}{2}} i$$

실재하지 않는 근 $\pm \sqrt{\frac{\sqrt{17} - 1}{2}} i$ 은 수치적으로 찾기 어렵다.

4.



The image shows a MATLAB interface with two main windows. The left window is the Command Window, and the right window is the Editor.

Command Window:

```
sol =  
1.3065  
fx >> |
```

Editor:

```
1 clearvars; clc;  
2 x0=1;  
3 x1=2;  
4 tol=1e-6; ErrorValue=tol+1;  
5 while ErrorValue > tol  
6 % -- compute function values  
7 y0=fnc_f(x0);  
8 y1=fnc_f(x1);  
9 % -- Secant update  
10 x2=x1-y1*(x1-x0)/(y1-y0);  
11 % -- compute error  
12 ErrorValue=abs(x2-x1);  
13 % -- update x  
14 x0=x1;  
15 x1=x2;  
16 end  
17 sol=x2  
18  
19 function yp=fnc_f(x)  
20 yp= (x.^2-1)./(2*x)-cot(x);  
21 end
```