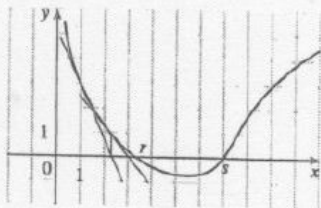


# Math 1a Homework Solutions

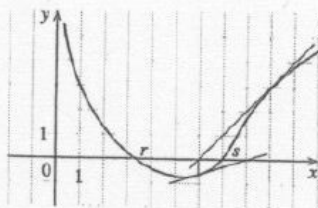
## Section 4.8

1.



The tangent line at  $x = 1$  intersects the  $x$ -axis at  $x \approx 2.3$ , so  $x_2 \approx 2.3$ . The tangent line at  $x = 2.3$  intersects the  $x$ -axis at  $x \approx 3$ , so  $x_3 \approx 3.0$ .

2.



The tangent line at  $x = 9$  intersects the  $x$ -axis at  $x \approx 6.0$ , so  $x_2 \approx 6.0$ . The tangent line at  $x = 6.0$  intersects the  $x$ -axis at  $x \approx 8.0$ , so  $x_3 \approx 8.0$ .

8.  $f(x) = x^7 - 1000 \Rightarrow f'(x) = 7x^6$ , so  $x_{n+1} = x_n - \frac{x_n^7 - 1000}{7x_n^6}$ . We need to find approximations until they agree to eight decimal places.  $x_1 = 3 \Rightarrow x_2 \approx 2.76739173$ ,  $x_3 \approx 2.69008741$ ,  $x_4 \approx 2.68275645$ ,  $x_5 \approx 2.68269580 \approx x_6$ . So  $\sqrt[7]{1000} \approx 2.68269580$ , to eight decimal places.

20. (a)  $f(x) = \frac{1}{x} - a \Rightarrow f'(x) = -\frac{1}{x^2}$ , so  $x_{n+1} = x_n - \frac{1/x_n - a}{-1/x_n^2} = x_n + x_n - ax_n^2 = 2x_n - ax_n^2$ .

- (b) Using (a) with  $a = 1.6894$  and  $x_1 = \frac{1}{2} = 0.5$ , we get  $x_2 = 0.5754$ ,  $x_3 \approx 0.588485$ , and  $x_4 \approx 0.588789 \approx x_5$ . So  $1/1.6894 \approx 0.588789$ .

22.  $x^3 - x = 1 \Leftrightarrow x^3 - x - 1 = 0$ .  $f(x) = x^3 - x - 1 \Rightarrow f'(x) = 3x^2 - 1$ , so  $x_{n+1} = x_n - \frac{x_n^3 - x_n - 1}{3x_n^2 - 1}$ .

(a)  $x_1 = 1$ ,  $x_2 = 1.5$ ,  $x_3 \approx 1.347826$ ,  $x_4 \approx 1.325200$ ,  $x_5 \approx 1.324718 \approx x_6$

(b)  $x_1 = 0.6$ ,  $x_2 = 17.9$ ,  $x_3 \approx 11.946802$ ,  $x_4 \approx 7.985520$ ,  $x_5 \approx 5.356909$ ,  $x_6 \approx 3.624996$ ,  $x_7 \approx 2.505589$ ,  $x_8 \approx 1.820129$ ,  $x_9 \approx 1.461044$ ,  $x_{10} \approx 1.339323$ ,  $x_{11} \approx 1.324913$ ,  $x_{12} \approx 1.324718 \approx x_{13}$

(c)  $x_1 = 0.57$ ,  $x_2 \approx -54.165455$ ,  $x_3 \approx -36.114293$ ,  $x_4 \approx -24.082094$ ,  $x_5 \approx -16.063387$ ,  $x_6 \approx -10.721483$ ,  $x_7 \approx -7.165534$ ,  $x_8 \approx -4.801704$ ,  $x_9 \approx -3.233425$ ,  $x_{10} \approx -2.193674$ ,  $x_{11} \approx -1.496867$ ,  $x_{12} \approx -0.997546$ ,  $x_{13} \approx -0.496305$ ,  $x_{14} \approx -2.894162$ ,  $x_{15} \approx -1.967962$ ,  $x_{16} \approx -1.341355$ ,  $x_{17} \approx -0.870187$ ,  $x_{18} \approx -0.249949$ ,  $x_{19} \approx -1.192219$ ,  $x_{20} \approx -0.731952$ ,  $x_{21} \approx 0.355213$ ,  $x_{22} \approx -1.753322$ ,  $x_{23} \approx -1.189420$ ,  $x_{24} \approx -0.729123$ ,  $x_{25} \approx 0.377844$ ,  $x_{26} \approx -1.937872$ ,  $x_{27} \approx -1.320350$ ,  $x_{28} \approx -0.851919$ ,  $x_{29} \approx -0.200959$ ,  $x_{30} \approx -1.119386$ ,  $x_{31} \approx -0.654291$ ,  $x_{32} \approx 1.547010$ ,  $x_{33} \approx 1.360051$ ,  $x_{34} \approx 1.325828$ ,  $x_{35} \approx 1.324719$ ,  $x_{36} \approx 1.324718 \approx x_{37}$ .