1. All possible zeros of the polynomial $p(x) = 2x^5 - 2x^4 + 7x^3 - 8x^2 + 4x - 16$ are (Sec 3.3): 1) ± 1, $\pm\frac{1}{2}$, ± 2, ± 4, ± 8, ± 16 2) ± 1, ± 2, ± 4, ± 8, ± 16 3) ± 1, $\pm\frac{1}{2}$, $\pm\frac{1}{4}$, $\pm\frac{1}{8}$, $\pm\frac{1}{16}$ 4) ± 1, $\pm\frac{1}{2}$, ± 2, $\pm\frac{1}{4}$, $\pm\frac{1}{8}$, $\pm\frac{1}{16}$

2. The horizontal asymptote(s) of $f(x) = \frac{3(x-4)(2x+3)}{x^2-9}$ is (are) given by (Sec 3.5): 1)$y = 8$ 2)$y = 3$ 3)$y = 0$ 4)$y = 6$

3. The smallest positive integer detected by the " Bounds Theorem" as an upper bound for the real zeros of $p(x) = 2x^3 + 4x^2 - 8x + 3$ is (Sec 3.3): 1)2 2)4 3)3 4)1

4. Use the Descartes' Rule of Signs to discuss the nature of all zeros of $p(x) = 4x^4 - 7x^3 + 3x + 2$. Write all possibilities in a table. (Sec 3.3)

5. Use the Descartes' Rule of Signs to discuss the nature of all zeros of $p(x) = 2x^5 - 5x^4 - 12x^3 + 3x^2 - 14x + 8$. Write all possibilities in a table. (Sec 3.3)

6. Given that $3i$ is a zero of multiplicity 2 of $p(x) = x^5 - x^4 + 18x^3 - 18x^2 + 81x - 81$. Find the other zeros. (Sec 3.4)

7. Find the solution of the equation $\frac{1}{2}x^3 + \frac{1}{6}x^2 - \frac{4}{3}x + \frac{2}{3} = 0$. (Sec 3.3)

8. Find a polynomial $p(x)$ of degree 6 such that -3, 1, and 2 are its only zeros, its graph is above the x-axis between 1 and ∞, below the x-axis between $-\infty$ and 1, and $p(0) = -9$. [Hint, Draw a rough graph of $p(x)$] (Sec 3.2)

9. Consider the rational function $f(x) = \frac{x^3-4x}{x^2-3x+2}$. a) Find all asymptotes, if any, of $f(x)$. b)Find the x-intercept(s), y-intercept and the hole(s), if any, of $f(x)$. c) Sketch the graph of $f(x)$. [Note: you must use all of the information obtained in (9a) and (9b)] (Sec 3.5)

10. A monic polynomial has real coefficients and the lowest possible degree. Two of its zeros are 3 and $2 + i$. This polynomial must be one of the following: (Sec 3.4) 1)$x^3 - 7x^2 + 15x - 9$ 2)$x^3 + x^2 - 13x + 3$ 3)$x^3 - 3x^2 + 5x - 15$ 4)$x^3 - 7x^2 + 17x - 15$ 1)$x^3 - 3x^2 + 4x - 12$

11. The zeros of the polynomial $x^3 - 23x^2 + 167x - 385$ are all positive integers. What is the sum of the zeros? (Sec 3.3) 1)23 2)6 3)18 4)12 5)16

12. The graph of $y = \frac{x^2+1}{ax^2+bx+c}$ has a horizontal asymptote $y = 1$ and two vertical asymptotes given by $x = -3$ and $x = 1$. What is the value of $2d + b + c$? (Sec 3.5) 1) -6 2)1 3)6 4) -7 5) -3

13. To apply the Rational Zeros Theorem on a polynomial $p(x)$, all coefficients of $p(x)$ should be (Sec 3.3) 1) Real numbers 2)Nonreal numbers 3)Real or nonreal numbers 4)Integers

14. If $f(x)=\frac{p(x)}{q(x)}$ is a rational function and a is a real number, then $x=a$ is a vertical asymptote of the graph of $f(x)$ if (Sec 3.5) 1)$p(a)=0$ and $q(a)\neq 0$ 2)$p(a)=0$ and $q(a)=0$ 3)$p(a)\neq 0$ and $q(a)=0$ 4)$p(a)\neq 0$ and $q(a)\neq 0$

15. Let $p(x)$ be a polynomial with real coefficients. If U is an upper bound for all real zeros of $p(x)$, L is a lower bound for all real zeros of $p(x)$, and C is a real zero of $p(x)$ such that $U\neq L\neq C$, then (Sec 3.3): 1)$L<C<U$ 2)$U<C<L$ 3)$L<U<C$ 4)$U<L<C$

16. Find the solution set of the equation $x^4+x^3-2x^2-6x-4=0$. (Sec 3.3)

17. Graph the polynomial function $p(x)=x^2(4x^2-1)$ (Showing all intercepts) (Sec 3.2)

18. If $2+i$ is a zero of $p(x)=^4 -4x^3+6x^2-4x+5$, find the other zeros. (Sec 3.4)

19. Given the rational function $f(x)=\frac{x^3-2x^2-3x}{x^3-x}$ 1) Find all asymptotes and missing points 2)Graph $f(x)$ (Sec 3.5)

20. Let $f(x)=\frac{ax^2+2x-4}{x^2-b}$. If $x=-1$ and $y=2$ are vertical and horizontal asymptotes of $f(x)$, then the graph has a hole or missing point at (Sec 3.5) 1) $(-1,0)$ 2) $(1,0)$ 3) $(-2,1)$ 4) $(3,1)$ 5) $(1,3)$

21. If $2-i$ is a zero with multiplicity two of $p(x)=x^5-9x^4+34x^3-66x^2+65x-25$, then the sum of the non real zeros is: (Sec 3.4) 1)-9 2)8 3)$8-4i$ 4)$8+4i$ 5)$4i$

22. The sum of all real zeros of $6x^4-x^3+5x^2-x-1$ is (Sec 3.3) 1)0 2)$\frac{1}{6}$ 3)1 4)$-\frac{1}{6}$ 5)$\frac{5}{6}$

23. The graph of the polynomial $p(x)=(1-x)\left(x^2-3x+2\right)$ is above the x-axis on (Sec 3.2) 1) $(-\infty,-1)\cup(1,2)$ 2) $(1,2)$ 3) $(-\infty,2)$ 4) $(-\infty,-1)\cup(1,2)$ 5) $(2,\infty)$

24. The degree of a polynomial of lowest degree with real coefficients and has zeros 3 (of multiplicity 2), $2-i$ (of multiplicity 4), and $1+\sqrt{2}$ is (Sec 3.4): 1)6 2)11 3)8 4)12 5)5

25. The sum of all integer zeros of the polynomial $f(x)=x^3-\frac{4}{3}x^2+\frac{5}{3}x+\frac{2}{3}$ is (Sec 3.3): 1)0 2)3 3)-3 4)-1 5)1

26. A polynomial $p(x)$ of least degree such that the graph of $p(x)$ crosses the x-axis at $x=3$, touches x-axis at $x=1$, and has y-intercept 6 is: 1)$-2x^3+10x^2-14x+6$ 2)$-2x^3+2x^2+10x+6$ 3)$-2x^3-5x^2+7x+6$ 4)$2x^2-8x+6$ 5)$\frac{2}{3}\left(x^3-7x^2+15x+9\right)$