Pre-Calculus First Semester Review

Non-Calculator

For the following:
(a) Identify the parent
(b) State the transformation rule(s).
(c) Sketch the graph.

[1.5] 1. $f(x) = \dfrac{1}{x+2} - 3$

a) _____

b) _____

[1.4] 2. $f(x) = -2|x + 3| + 1$

a) _____

b) _____

[1.5] 3. $f(x) = -2(x+1)^2 + 4$
[2.1]

a) _____

b) _____

Vertex: _____

Axis of symmetry: _____

[1.5] 4. $f(x) = x^2 + 8x + 11$
[2.1]

a) _____

b) _____

Vertex: _____

Axis of symmetry: _____

[3.3] 5. $f(x) = \log(x - 2)$

a) _____

b) _____

[3.3] 6. $f(x) = \ln(1 - x) - 3$

a) _____

b) _____

[3.1] 7. $f(x) = 3^{x+2}$

a) _____

b) _____

Solve. Check for extraneous roots.

[P3] 8. $2(5-2y)-3(1-y) \geq y+1$

[P3] 9. $\frac{x-2}{3}+\frac{x+5}{2}=\frac{1}{3}$

[P5] 10. $|2x-5| > 4.2$

[P5] 11. $|-x+4|-3 \leq 7$

[P5] 12. $\frac{3x}{x+1}+\frac{5}{x-2}=\frac{15}{x^2-x-2}$

[P5] 13. $4x^2-7x+5=0$

[2.7]

[P5] 14. $-3 \leq 1-2x < 7$

[2.8] 15. $\frac{2x+1}{(x+3)(x-1)} \leq 0$

[2.8] 16. $x^3-2x^2+x \geq 0$

[2.8] 17. $\frac{2}{x+1}-\frac{3}{x-5} > 0$

[P1] Simplify. Express your answer without negative exponents.

18. $\dfrac{\left(uv^{-2}\right)^{-3}}{u^{-5}v^{2}}$

19. $\dfrac{4a^{3}b}{a^{2}b^{3}} \cdot \dfrac{3b^{2}}{2a^{2}b^{4}}$

[P4] 20. Write a general form equation of a line a) parallel to and b) perpendicular to $5x - y = 7$ and passing through the point $(3, -4)$.

[1.2] Find the domain. Express the answer in interval notation.

21. $f(x) = \sqrt{x^{2} + 3}$

22. $f(x) = \dfrac{\sqrt{x}}{x - 5}$

[1.3] Prove algebraically whether the function is even, odd, or neither.

23. $f(x) = 3x^{3} - 2x$

24. $f(x) = -2x^{4} - 4x + 7$

[1.4] Given $f(x) = (x - 4)^{2}$, $g(x) = 2x - 3$ and $h(x) = \sqrt{x + 5}$ Find and simplify the answer.

25. $f \circ h(4)$

26. $g(f(x))$

27. $f + g$

28. fg

[1.4] 29. Given: $f(x) = x^3 + 2$. Find $f^{-1}(x)$.

[1.4] 30. **Prove** that f and g are inverses of each other.

$f(x) = 2x + 8 \qquad g(x) = \dfrac{x - 8}{2}$

[2.3] Describe the end behavior of the polynomial using **limit** notation.

31. $f(x) = -2x^3 + 4x^2 + 1$

32. $f(x) = 3x^4 + x^2 - 5$

[2.3] Find the zeros of the function algebraically.

33. $f(x) = 3x^2 + 2x - 5$

34. $f(x) = x^3 - 36x$

[2.4] Find the zeros of the function and write the function as a product of linear and irreducible quadratic factors all with real coefficients.

35. $f(x) = x^3 - x^2 - x - 2$, given that $x = 2$

36. $f(x) = x^4 + 3x^3 - 3x^2 + 3x - 4$, given that $x = 1$ and $x = -4$

[2.7] Find (if it exists) the a) asymptotes b) intercepts and c) domain of the function. Sketch the graph by hand.

37. $g(x) = \dfrac{4x-5}{x-3}$

38. $g(x) = \dfrac{2x^2}{x^2 - x - 6}$

[3.3] 39. Simplify

a) $\log_{11} 11^4$

b) $\log_5 1$

c) $\ln \dfrac{1}{e}$

d) $\log \sqrt[4]{10}$

e) $\log_9 \dfrac{1}{27}$

f) $3^{\log_3 7}$

Graphing Calculator

[1.1] Solve by graphing.

40. $3x - 2 = \sqrt{x+4}$

41. $0 = x^3 + x^2 - 5x + 3$

[1.2] 42. Find all a) local maxima and minima and b) identify intervals on which the function is increasing, decreasing, or constant.

$f(x) = x^3 + 2x^2 - 6x$

[1.2] Graph the function and tell whether or not it has a point of discontinuity at $x = 0$. If there is a discontinuity, tell whether it is removable or non-removable.

43. $f(x) = \dfrac{|x|}{x}$

44. $h(x) = \dfrac{x^2 + x}{x}$

[1.3] Sketch the graph of the piecewise-defined function. State whether the function is continuous or discontinuous at $x = 0$.

45. $f(x) = \begin{cases} x \ \ if \ \ x \le 0 \\ x^2 \ \ if \ \ x > 0 \end{cases}$

46. $f(x) = \begin{cases} -|x| \ \ if \ \ x < 0 \\ 2 \ \ if \ \ x \ge 0 \end{cases}$

[1.6] 47. Sue invested $10,000, part at 3.6% annual interest and the balance 7.8% annual interest. How much is invested at each rate if a 1-year interest payment is $667.02?

[1.6] 48. Joe Pearlman received a 3.5% pay decrease. His salary after the decrease was $27, 985. What was his salary before the decrease?

[1.6] 49. The chemistry lab at the University of Hardwoods keeps two acid solutions on hand. One is 20% acid and the other is 35% acid. How much 20% acid solution and how much 35% acid solution should be used to prepare 25 liters of a 26% acid solution?

[2.1] 50. Write an equation for the linear function $\boldsymbol{f}$ with $f(-3) = -2$ and $f(4) = -8$. Express your answer in general form.

[2.2] 51. Write the statement as a power function equation and answer the question. The electrical resistance of a wire varies directly as its length and inversely as the square of the diameter of the wire. Suppose 50 mm of a wire of diameter 3 mm has a resistance of 8 Ω. What is the resistance of 40 mm of the same type of wire if the diameter is 4 mm?

[2.1] 52. The table below gives the weight and pulse rate of selected mammals.

a) Write a power regression equation and state the power and constant of variation.

Mammal	Body Weight	Pulse Rate (beats/min)
Rat	0.2	420
Guinea Pig	0.3	300
Rabbit	2	205
Small Dog	5	120
Large Dog	30	85
Sheep	50	70
Human	70	72

b) Use the regression equation to determine the pulse rate of a human weighing 12 pounds.

[2.4] Divide. Write a summary statement in polynomial form. Determine if the first polynomial is a factor of the second polynomial.

53. $2x + 1$; $6x^3 - 5x^2 + 9$

54. $x - 5$; $x^3 - 4x^2 - 7x + 10$

[2.4 & 2.6] Find a polynomial equation with the given zeros. Express answers in standard form.

55. $\frac{1}{3}, -2, 5$

56. a) $-1, 2 - i$ b) $3, 4i$

[2.5] 57. Write in $a + bi$ form: $\frac{2 + 4i}{3 - 2i}$

[3.2] 58. Shan invested \$100 at 3.5% interest compounded monthly. How long will it take for
[3.6] her investment to double? Solve algebraically and graphically.

[3.2] 59. A radioactive isotope decays at a rate of 3% per day. A scientist has an initial amount of 50 g. Write an equation of the form $y = ab^x$ for the number of grams y remaining after x days. Determine approximately how many days it will take for half the isotope to decay. Solve algebraically and graphically.

[3.6] 60. Find the amount accumulated after investing a principal of \$3000 for 3 years at an interest rate of 6.5% (a) compounded weekly (b) compounded continuously.

[3.4] 61. Rewrite the expression as a sum or difference of multiple logarithms.

a) $\log_3(a^2b)$

b) $\log_3 \dfrac{\sqrt{a}}{bc}$

[3.4] 62. Express as a single logarithm. Simplify.

a) $2\log r - \log q + 3\log w$

b) $\dfrac{1}{3}\log 27 - 2\log 4$

[3.5] Solve. NOTE: DO NOT use your calculator for 64, 66-68!

63. $2(5)^x = 26$

64. $\log x = -2$

65. $2e^x = 3.4$

66. $\log_3(2 - 3x) + 5 = 9$

67. $\log (x^2 + 21x) = 2$

68. $\log_2 (x - 1) - \log_2 (2x + 3) = 3$