1. Factor: $64n^3 - 27$ SOAP

$$(4n - 3)(16n^2 + 12n + 9)$$

2. Find the remainder:

$$(2x^4 - x^3 + 6x^2 + 3x + 4) \div (x + 1)$$

$$\begin{array}{r|rrrrr} -1 & 2 & -1 & 6 & 3 & 4 \\ & \downarrow & -2 & 3 & -9 & 6 \\ \hline & 2 & -3 & 9 & -6 & 10 \end{array}$$

$\boxed{10}$

3. If 4, $8 - 5i$, and 2 are roots of a quartic polynomial, what is the other root?

$\boxed{8 + 5i}$

4. Describe the end behavior of

$$f(x) = -x^7 + 10x.$$

$x \to -\infty \quad f(x) \to \underline{\infty}$

$x \to +\infty \quad f(x) \to \underline{-\infty}$

5. Find all the zeros of $f(x) = x^3 + 5x^2 + x + 5$

$(x^3 + 5x^2) + (x + 5)$.

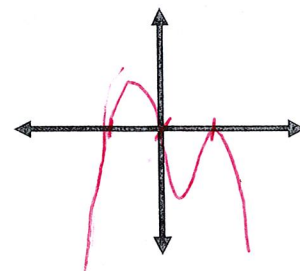$x^2(x + 5) + 1(x + 5)$ $\boxed{-5, \pm i}$

$(x + 5)1(x^2 + 1)$

$x + 5 = 0 \quad | \quad x^2 + 1 = 0$

$x = -5 \quad | \quad x^2 = -1$

$\quad\quad\quad | \quad x = \pm i$

6. **Sketch** a graph of a polynomial with the zeros x = -3, 0, 1, 1

7. Solve: $2x^3 - 3x^2 - 32x > -48$

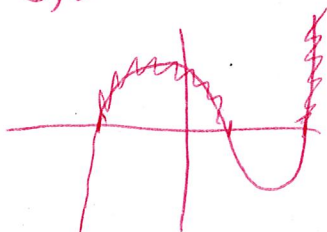$(2x^3 - 3x^2)(-32x + 48) > 0$ $\boxed{(-4, \frac{3}{2}) \cup (4, \infty)}$

$x^2(2x - 3) - 16(2x - 3) > 0$

$(2x - 3)(x^2 - 16) > 0$

$2x - 3 = 0 \quad | \quad x^2 - 16 = 0$

$2x = 3 \quad | \quad x^2 = 16$

$x = \frac{3}{2} \quad | \quad x = \pm 4$

8. Find the values for which the functions is undefined $f(x) = \dfrac{x^2 - 4}{x^2 + x - 2}$

$x^2 + x - 2 = 0$

$(x + 2)(x - 1) = 0$

$x + 2 = 0 \quad | \quad x - 1 = 0$

$x = -2 \quad | \quad x = 1$

$\boxed{x \neq -2, 1}$

9. Simplify $f(x) = \dfrac{x^2 + 3x - 18}{x^2 - 36}$

$\dfrac{(x + 6)(x - 3)}{(x + 6)(x - 6)} = \boxed{\dfrac{x - 3}{x - 6}}$

10. Add $\dfrac{5}{x - 2} + \dfrac{4x}{x - 2}$ $= \boxed{\dfrac{4x + 5}{x - 2}}$

11. Divide $\dfrac{x^2+4x-12}{x^2+9x+18} \div \dfrac{x^2-4}{x^2+3x}$

$\dfrac{(x+6)(x-2)}{(x+6)(x+3)} \cdot \dfrac{x(x+3)}{(x+2)(x-2)} = \boxed{\dfrac{x}{x+2}}$

12. Solve $\dfrac{5x}{x+3} = 7 + \dfrac{.6}{x+3}$

$\dfrac{x+3}{1} \cdot \dfrac{5x}{x+3} = \dfrac{7}{1} \cdot \dfrac{x+3}{1} + \dfrac{6}{x+3} \cdot \dfrac{x+3}{1}$

$5x = 7x + 21 + 6$

$-27 = 2x \qquad \boxed{x = \dfrac{-27}{2}}$

13. Find the hole $f(x) = \dfrac{x^2+2x-8}{x^2-x-2}$

$\dfrac{(x+4)(x-2)}{(x+1)(x-2)} \qquad x=2$

$\dfrac{(2+4)}{(2+1)} = \dfrac{6}{3} = 2$

$\boxed{(2,2)}$

14. Find the equation of the slant asymptote

of $f(x) = \dfrac{x^2+2x-3}{x-2}$

$\begin{array}{r|rrr} 2 & 1 & 2 & -3 \\ & \downarrow & 2 & 8 \\ \hline & 1 & 4 & 5 \end{array}$

$\boxed{y = 1x + 4}$

15. Find the x-intercepts and the y-intercept

of $f(x) = \dfrac{x^2+2x-8}{x^2-4} \quad \dfrac{(x+4)(x-2)}{(x+2)(x-2)}$

x-intercepts: $(-4, 0)$
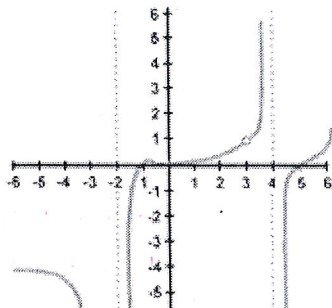
y-intercepts: $(0, 2)$

16. Determine the horizontal and vertical

asymptotes of $f(x) = \dfrac{4x-1}{2x+6} \quad \dfrac{4x-1}{2(x+3)}$

horizontal: $y = 2$

Vertical: $x = -3$

17. Find the domain and range of the function.
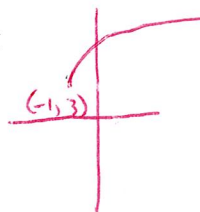
$D = (-\infty, -2) \cup (-1, 3)$
$\cup (3, 4) \cup (4, \infty)$

$R = (-\infty, 1) \cup (1, \infty)$

18. Find the domain and range of

$f(x) = \sqrt{3(x+1)} + 3$

$(-1, 3)$

$D: [-1, \infty)$

$R: [3, \infty)$

19. Solve $(\sqrt{x+8})^2 = (x+2)^2$

$x+8 = x^2 + 4x + 4$

$0 = x^2 + 3x - 4$

$0 = (x+4)(x-1)$

$x+4=0, \quad x-1=0$

$x = -4, \quad x = 1$

$\boxed{x = -1}$

20. Find the starting point of

$f(x) = 3\sqrt{2(x-1)} + 5$

$(1, 5)$

21. Solve $3(x - 5)^{1/3} = -9$

$$\left((x-5)^{\frac{1}{3}}\right)^3 = (-3)^3$$
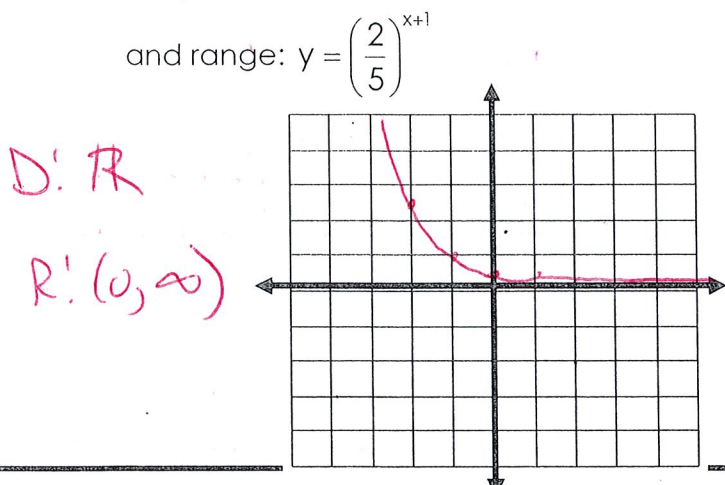
$$x - 5 = -27$$

$$x = -22$$

22. Condense the following:

$3\log x + \log 4 - \log x - \log 6$

$\log x^3 + \log 4 - \log x - \log 6$

$$\boxed{\log \frac{4x^3}{6x}}$$

23. Graph the function and state the domain and range: $y = \left(\dfrac{2}{5}\right)^{x+1}$

D: $\mathbb{R}$

R: $(0, \infty)$

24. The number of bacteria N in a culture is given by the model $N = 100e^{0.219t}$ where t is in hours. Find the number of bacteria after 6 hours.

$$N = 100 e^{0.219(6)}$$

$$\boxed{N = 372.10 \text{ or } 372}$$

25. Solve: $\log_3(x - 3) + 3 = 5$

$\log_3(x-3) = 2$

$3^2 = x - 3$

$9 = x - 3$ $\boxed{x = 12}$

26. Solve: $e^{2x} + 5 = 12$

$e^{2x} = 7$

$\ln 7 = 2x$

$1.95 = 2x$

$\boxed{.97 \text{ or } .98}$

27. If $1800 is invested at a rate of 14% compounded continuously, Find the balance in the account after 8 years.

$A = Pe^{rt}$

$A = 1800 e^{.14(8)}$

$\boxed{A = \$5516.74}$

28. Identify if the following are increasing or decreasing.

a. $y = 5(3)^x$ $\boxed{\text{increasing}}$

b. $y = -(2)^x$ $\boxed{\text{decreasing}}$

c. $y = -\left(\dfrac{1}{3}\right)^x$ $\boxed{\text{increasing}}$

29. Solve: $4^x = 8^{x-1}$

$(2^2)^x = (2^3)^{x-1}$

$2x = 3x - 3$

$\boxed{3 = x}$

30. Write the standard form of the equation of an exponential function with a base of 10, $y = 10^x$, that has been reflected over the x-axis, shifted right 3, and down 5.

$y = a b^{x-h} + k$

$$\boxed{y = -(10)^{x-3} - 5}$$

31. What are the solutions of the equation
$4(x-3)^2 - 7 = 33$

$4(x-3)^2 = 40$
$(x-3)^2 = 10$
$x - 3 = \pm\sqrt{10}$

$\boxed{x = 3 \pm \sqrt{10}}$

32. Simplify the fraction $\dfrac{4-2i}{5+3i}$

$\dfrac{4-2i}{5+3i} \cdot \dfrac{5-3i}{5-3i} = \dfrac{20-12i-10i+6i^2}{25-15i+15i-9i^2} = \dfrac{20-22i-6}{25+9}$

$= \dfrac{14-22i}{34} = \boxed{\dfrac{7-11i}{17}}$

33. Solve the equation: $\dfrac{1}{3}x^2 + 3 = -9$.

$\frac{1}{3}x^2 + 3 = -9$
$\frac{1}{3}x^2 = -12$
$x^2 = -36$

$\boxed{x = \pm 6i}$

34. Use the quadratic equation to solve the following: $x^2 + 4x - 2 = 0$

$\dfrac{-4 \pm \sqrt{4^2 - 4(1)(-2)}}{2(1)}$ → $\dfrac{-4 \pm 2\sqrt{6}}{2}$

$\dfrac{-4 \pm \sqrt{24}}{2}$ → $\boxed{-2 \pm \sqrt{6}}$

35. What number would we need to add to $x^2 - 12x = -8$ if you want to complete the square?
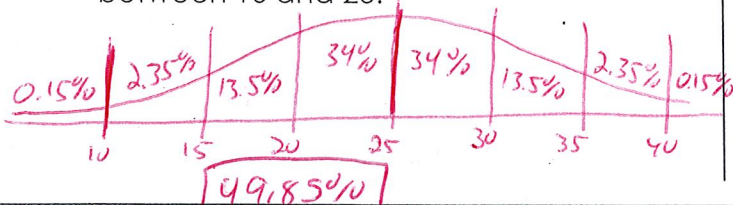
36

36. Find the x-intercepts for the following equation: $x^2 + 4x - 5 = 0$

$(x+5)(x-1) = 0$
$\boxed{x = -5, 1}$

37. A normal distribution has a mean of 25 and a standard deviation of 5. Draw the normal curve and find the probability between 10 and 25.

0.15% 2.35% 13.5% 34% 34% 13.5% 2.35% 0.15%
10   15   20   25   30   35   40

$\boxed{49.85\%}$

38. A normal distribution of ACT scores has a mean score of 18 and a standard deviation of 6. Within what range do about 68% of the scores fall?
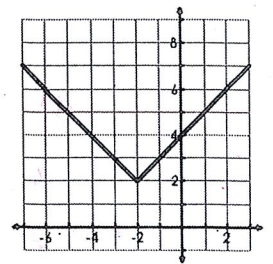
$\boxed{12-24}$

39. List the 6 types of Sampling Methods (be able to give an example of each)

-Self-Selected   – Random

-Systematic   – Stratified

– Convenience   –Clustered

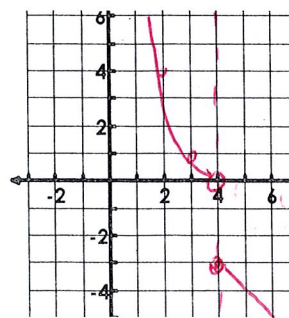40. Where is the graph decreasing?

$(-\infty, -2)$

41. Find the sum of the first 10 terms of the sequence -2, -6, -18, -54, ...

$S_n = \dfrac{a_1(1-r^n)}{1-r}$

$S_{10} = \dfrac{-2(1-3^{10})}{1-3}$

$S_{10} = -59048$

42. Graph $f(x) = \begin{cases} (x-4)^2 & x < 4 \\ -x+1 & x \ge 4 \end{cases}$

$x < 4$

x	y
4	0
3	1
2	4
1	9
0	16

$x \ge 4$

x	y
4	-3
5	-4
6	-5
7	-6