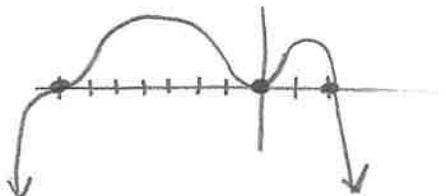


1. Sketch the graph $y = -x^2(x-2)(x+7)^3$

$y = -x^6$ ↓ ↓



2. Write the exact equation of the polynomial function that passes through the point (0, -4)

$x = -5, -1, 4, 7$

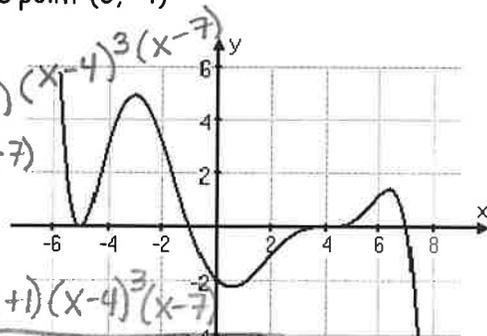
$y = a(x+5)^2(x+1)(x-4)^3(x-7)$

$-4 = a(25)(1)(-64)(-7)$

$-4 = 11,200a$

$y = \frac{-4}{11200}(x+5)^2(x+1)(x-4)^3(x-7)$

$y = \frac{-1}{2800}(x+5)^2(x+1)(x-4)^3(x-7)$



3. Write the polynomial function in standard form given the roots $x = -2, x = 0$ and $x = 5$.

$x = -2, x = 0, x = 5$

$(x+2)(x)(x-5) = 0$

$y = x(x^2 - 3x - 10) \rightarrow y = x^3 - 3x^2 - 10x$

4. Divide $x^4 - 2x^2 + 8x + 11$ by $x + 2$ and then write your answer (the quotient) in standard form.

$$\begin{array}{r} -2 \overline{) 1 \ 0 \ -2 \ 8 \ 11} \\ \underline{\downarrow -2 \ 4 \ -4 \ -8} \\ 1 \ -2 \ 2 \ 4 \ 3 \end{array}$$

$x^3 - 2x^2 + 2x + 4 + \frac{3}{x+2}$

5. Solve (find the zeros). $x^3 - 19x + 30 = 0$

$\frac{P}{Q} = \pm 1, 2, 3, 5, 6, 10, 15, 30$

$$\begin{array}{r} \underline{) 1 \ 0 \ -19 \ 30} \\ \underline{\downarrow 1 \ 1 \ -18} \\ 1 \ 1 \ -18 \ 12 \end{array}$$

$$\begin{array}{r} \underline{) 1 \ 0 \ -19 \ 30} \\ \underline{\downarrow 2 \ 4 \ -30} \\ 1 \ 2 \ -15 \ 0 \end{array}$$

$x = 2$

$x^2 + 2x - 15 = 0$
 $(x+5)(x-3) = 0$

$x = -5$ $x = 3$

6. List all the possible rational roots of $7x^3 + 3x + 11 = 0$

$\frac{P}{Q} = \frac{\pm 1, 11}{\pm 1, 7}$

$\pm 1, \pm 11, \pm \frac{1}{7}, \pm \frac{11}{7}$

7. Find all the roots (zeros) of $x^4 - 5x^3 + 10x^2 - 20x + 24 = 0$

$\frac{P}{Q} = \pm 1 \pm 2 \pm 3 \pm 4 \pm 6 \pm 8 \pm 12 \pm 24$

$$\begin{array}{r} \underline{) 1 \ -5 \ 10 \ -20 \ 24} \\ \underline{\downarrow 1 \ -4 \ 6 \ -14} \\ 1 \ -4 \ 6 \ -14 \ 10 \end{array}$$

$$\begin{array}{r} \underline{) 1 \ -5 \ 10 \ -20 \ 24} \\ \underline{\downarrow 2 \ -6 \ 8 \ -24} \\ 1 \ -3 \ 4 \ -12 \ 0 \end{array} \quad x = 2$$

$$\begin{array}{r} \underline{) 1 \ -3 \ 4 \ -12} \\ \underline{\downarrow 3 \ 0 \ 12} \\ 1 \ 0 \ 4 \ 0 \end{array} \quad x = 3$$

$x^2 + 4 = 0$

$x^2 = -4$

$x = \pm 2i$

8. Find an exponential growth model ($y = ab^x + k$) whose graph passes through the points (1, 48) and (3, 123) and has the asymptote $y = -12$

(1, 48) $48 = a \cdot b^1 + -12 \rightarrow 60 = a \cdot b^1$

(3, 123) $123 = a \cdot b^3 - 12 \rightarrow 135 = a \cdot b^3$

$a = \frac{60}{b^1}$

$135 = \frac{60}{b^1} \cdot b^3$

$135 = 60 \cdot b^2$

$\sqrt{\frac{135}{60}} = \sqrt{b^2}$

$\sqrt{2.25} \quad b = 1.5$

$a = 60 \div \frac{3}{2} \quad a = 40$

$y = (40)(1.5)^x - 12$

9. Solve. $\log_7(3x) + \log_7(x-2) = \log_7(2-x)$

$\log_7[3x(x-2)] = \log_7(2-x)$ 1:1 prop

$3x(x-2) = 2-x$

$3x^2 - 6x = 2 - x$

$3x^2 - 5x - 2 = 0$

$(3x+1)(x-2) = 0$

$x = -\frac{1}{3} \quad x = 2$

both are extraneous

No Solution

10. Factor $125x^3 + 27$

$125x^3 + 27$

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

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

$(5x)^3 + (3)^3 = (5x+3)(25x^2 - 15x + 9)$

$a = 5x$
 $b = 3$

11. Expand the logarithm. $\log\left(\frac{3m^5\sqrt{n^4}}{7p}\right)$

$= \log\left(\frac{3^1 m^5 n^{\frac{4}{5}}}{7^1 p^1}\right) \rightarrow \log(3^1 m^5 n^{\frac{4}{5}} \cdot 7^{-1} p^{-1})$

$= \log 3 + \log m + \frac{4}{5} \log n - \log 7 - \log p$

12. Find the inverse of $f(x) = \frac{\sqrt{2x+7}}{13}$

$x = \frac{\sqrt{2y+7}}{13}$

$13x = \sqrt{2y+7}$

$(13x)^2 = 2y+7$

$169x^2 = 2y+7$

$169x^2 - 7 = 2y$

$\frac{169x^2 - 7}{2} = y$

13. Use synthetic division to show that $\sqrt{5}$ is a zero of $g(x) = x^3 - 3x^2 - 5x + 15$

$\sqrt{5} \mid 1 \quad -3 \quad -5 \quad 15$
 $\downarrow \quad \sqrt{5} \quad -3\sqrt{5}+5 \quad -15$
 $\hline 1 \quad -3+\sqrt{5} \quad -3\sqrt{5} \quad \text{☺}$

$\sqrt{5}$ is a zero because the remainder equals zero!

$\sqrt{5}(-3+\sqrt{5}) = -3\sqrt{5}+5$
 $-3\sqrt{5}(\sqrt{5}) = -3(5) = -15$