

NO CALCULATOR

For questions 1 - 3, find the following:

- All asymptotes (horizontal, vertical, and slant), if they exist.
- All intercepts (x and y), if they exist.
- Holes, if they exist.
- The graph of each function ... plot at least 3 points per region.

1. $y = \frac{2x+3}{x-1}$

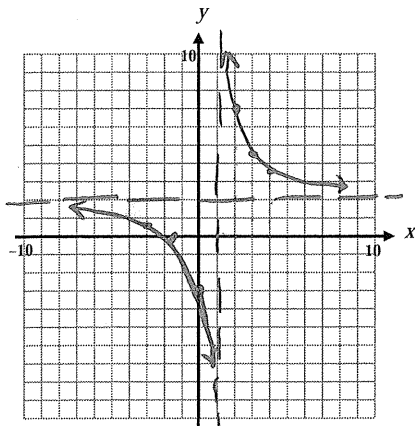
$\boxed{VA} x = 1$

$\boxed{HA} y = 2$

x-int: $0 = 2x + 3$

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

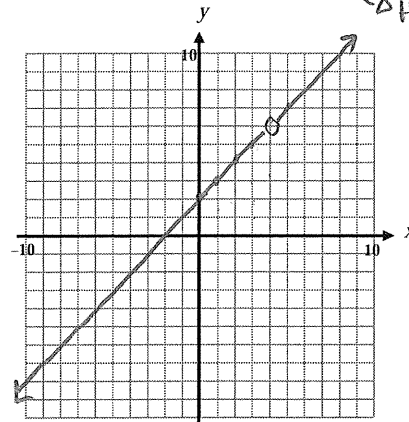
y-int: $y = \frac{0+3}{0-1} = -3$



2. $y = \frac{x^2 - 2x - 8}{x - 4} = \frac{(x-4)(x+2)}{x-4} = x+2$

Hole @ $x=4$

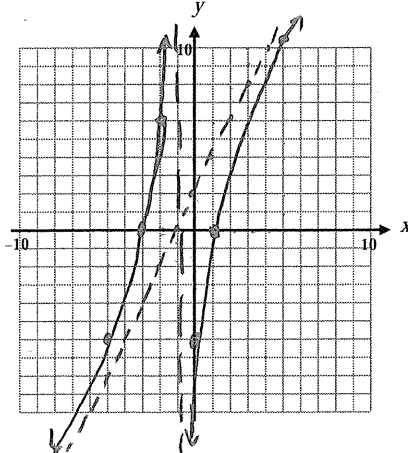
x	y
-3	.75
2	7
3	4.5
4	3.7



$(4, 6)$

The remaining function is $y = x + 2$
No Asymptotes!
Just a line with a hole.

3. $y = \frac{2x^2 + 4x - 6}{x + 1} = \frac{2(x^2 + 2x - 3)}{x + 1} = \frac{2(x+3)(x-1)}{x+1}$



VA: $x = -1$

No H.A.

find SLANT... $\begin{array}{r} -1 \overline{) 2 \quad 4 \quad -6} \\ \underline{-2 \quad -2} \quad -2 \\ \underline{ 2 \quad 2 \quad -8} \end{array}$

x-int: $(-3, 0)$ & $(1, 0)$

y-int: $y = \frac{0+0-6}{0+1} = -6$

SA $\boxed{y = 2x + 2}$

x	y
-2	6
-5	6
5	$10\frac{2}{3}$

4. Solve the following equation: $x^2 - 6x + 13 = 0$

$$x = \frac{6 \pm \sqrt{(6)^2 - 4(1)(13)}}{2(1)} = \frac{6 \pm \sqrt{36 - 52}}{2} = \frac{6 \pm \sqrt{-16}}{2}$$

$$= \frac{6 \pm 4i}{2}$$

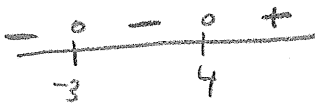
$$= \frac{6}{2} \pm \frac{4i}{2}$$

$$= \boxed{3 \pm 2i}$$

Algebraically solve each inequality.

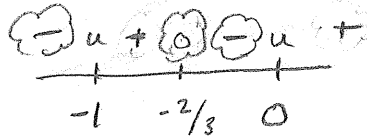
5. $(x-4)(x+3)^2 < 0$

MAKE A SIGN CHART



$(-\infty, -3) \cup (-3, 4)$

6. $\frac{3x+2}{(x+1)(2x)} \leq 0$



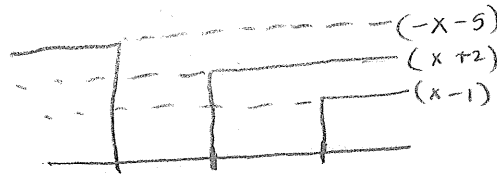
$(-\infty, -1) \cup [-2/3, 0)$

7. $\frac{1}{x+2} - \frac{2}{x-1} > 0$

$\frac{1}{(x+2)(x-1)} - \frac{2}{(x-1)(x+2)} > 0$

$\frac{x-1-2x-4}{(x+2)(x-1)} > 0$

$\frac{-x-5}{(x+2)(x-1)} > 0$



$(-\infty, -5) \cup (-2, 1)$

8. [Chapter P Review] Simplify: $\frac{m^3(3a)^{-4}}{m^{-7}a^{-3}} = \frac{m^3 m^7 a^3}{(3a)^4} = \frac{m^{10} a^3}{81a^4} = \frac{m^{10}}{81a}$

9. [Chapter P Review] Solve the following equation: $4|2x-3|-9 > 15$

$4|2x-3| > 24$

$|2x-3| > 6$

$2x-3 < -6$ OR $2x-3 > 6$

$2x < -3$ OR $2x > 9$

$x < -3/2$ OR $x > 9/2$

$(-\infty, -3/2) \cup (9/2, \infty)$

10. [Chapter 1 Review] Graph the following equation. Identify at least 3 points on the graph. $y = -\sqrt{3x-9}$
Describe the transformation.

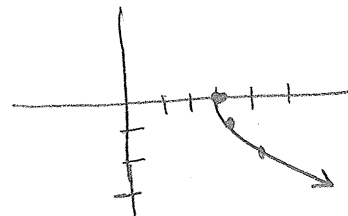
$y = -\sqrt{3(x-3)}$
↑ Don't forget this part

$(x, y) \rightarrow (\frac{x}{3} + 3, -y)$

$(0, 0) \rightarrow (3, 0)$

$(1, 1) \rightarrow (3\frac{1}{3}, -1)$

$(4, 2) \rightarrow (4\frac{1}{3}, -2)$



CALCULATOR ALLOWED

11. Given: $g(x) = x^4 - 2x^3 + 13x^2 - 32x - 48$.

(a) Use graphing, synthetic division and the quadratic formula to find all zeros.

↳ zeros look like $x = -1$ & $x = 3$

$$\begin{array}{r|rrrrrr} -1 & 1 & -2 & 13 & -32 & -48 \\ & & -1 & 3 & -16 & 48 \\ \hline 3 & 1 & -3 & 16 & -48 & 0 \\ & & 3 & 0 & 48 & \\ \hline & 1 & 0 & 16 & 0 & \end{array}$$

$$\begin{aligned} x^2 + 16 &= 0 \\ x^2 &= -16 \\ x &= \pm\sqrt{-16} \\ x &= \pm 4i \end{aligned}$$

Answer the question:

Zeros: $x = -1$
 $x = 3$
 $x = 4i$
 $x = -4i$

(b) Write the factorization of $g(x)$ as a product of linear factors and irreducible quadratic factors.

$$g(x) = (x+1)(x-3)(x^2+16)$$

12. Write an equation for the quadratic function with a vertex of $(-3, 4)$ and containing point $(-5, -8)$

$$\begin{aligned} y &= a(x+3)^2 + 4 \\ -8 &= a(-5+3)^2 + 4 \\ -8 &= 4a + 4 \end{aligned} \quad \begin{aligned} -12 &= 4a \\ -3 &= a \end{aligned}$$

$$y = -3(x+3)^2 + 4$$

13. Find a polynomial of degree 3 with roots -4 , and $5-i$. Express the answer in standard form.

$$\begin{aligned} y &= (x+4)(x-(5-i))(x-(5+i)) \\ y &= (x+4)[x-5+i][x-5-i] \\ y &= (x+4)[(x-5)+i][(x-5)-i] \\ y &= (x+4)[(x-5)^2 + 1] \\ y &= (x+4)(x^2 - 10x + 25 + 1) \end{aligned}$$

↳ $5+i$ & $5-i$ also!

$$\begin{aligned} y &= (x+4)(x^2 - 10x + 26) \\ y &= x^3 - 10x^2 + 26x + 4x^2 - 40x + 104 \\ y &= x^3 - 6x^2 - 14x + 104 \end{aligned}$$

$$y = x^3 - 6x^2 - 14x + 104$$

14. Perform the indicated operation.

(a) $(3-4i) - (-8+2i)$

$$3 - 4i + 8 - 2i$$

$$11 - 6i$$

(b) $\frac{3+i}{2-3i}$ (express the answer in $a+bi$ form)

$$\frac{(3+i)(2+3i)}{(2-3i)(2+3i)} = \frac{6+9i+2i+3i^2}{4+9} = \frac{3+11i}{13} = \frac{3}{13} + \frac{11}{13}i$$

$$\frac{3}{13} + \frac{11}{13}i$$

15. [Review Chapter 2a] Find the cubic regression equation (without rounding ANYTHING) for the following data. Let $x=0$ be the year 1970. Use your equation to predict the number of employees in the year 2004.

	Year	1972	1975	1978	1980	1983	1986
L ₁	Year	247	475	658	546	493	605
L ₂	Number of Employees	247	475	658	546	493	605

Find cubic reg

PASTE into Y₁ ...

VARS

, 5: Statistics, EQ, 1: RegEQ

$$y = -.8340011873x^3 - 25.87126589x^2 + 248.1148133x - 167.6765039$$

BACK TO MAIN SCREEN

VARS

, Y-VARS, Function, 1: Y₁

⇒ Plug in 34 ... Y₁(34) ≈ 11,141 employees