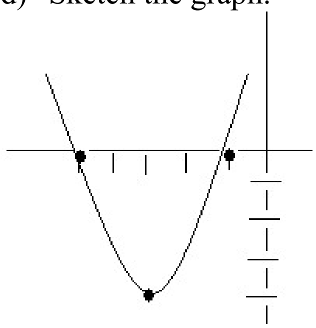
Solutions

1. Let $f(x) = x^2 + 6x + 5$
   a) Determine the x & y-intercepts.
   $0 = (x+1)(x+5)$
   $x = -1, \quad x = -5$
   $(-1,0) \ (-5,0)$
   b) Write the quadratic equation in standard form.
   $f(x) = x^2 + 6x + 9 - 9 + 5$
   $f(x) = (x+3)(x+3) - 4$
   $f(x) = (x+3)^2 - 4$
   c) Find the vertex of the quadratic function. (-3,-4)
   d) Sketch the graph.



2. Let $f(x) = \dfrac{x^2+1}{x-1}$. Find all asymptotes (vertical, horizontal and slant).

   v.a.: $x - 1 = 0$, $x = 1$ h.a.: none

   slant:
   $$\begin{array}{r} x + 1R2 \\ x-1\overline{)x^2+0x+1} \\ -(x^2-x) \\ x+1 \\ -(x-1) \\ 2 \end{array}$$
   $y = x + 1$

3. Let $f(x) = \ln(x+1) - 1$

a) Find the domain of $f(x)$.

$x + 1 > 0$

$D: x > -1$

b) Find the x & y-intercept of $f(x)$.

x-int

$0 = \ln(x+1) - 1$

$1 = \ln(x+1)$

$e^1 = e^{\ln(x+1)}$

$e = x + 1$

$e - 1 = x$

$(e-1, 0)$

y-int

$y = \ln(0+1) - 1$

$y = \ln(1) - 1$

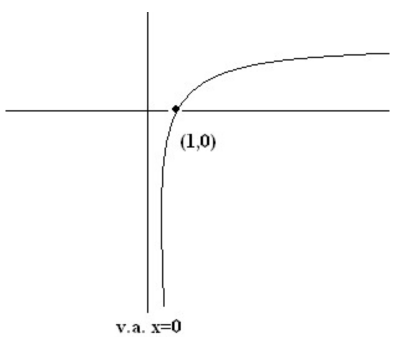
$y = 0 - 1$

$y = -1$

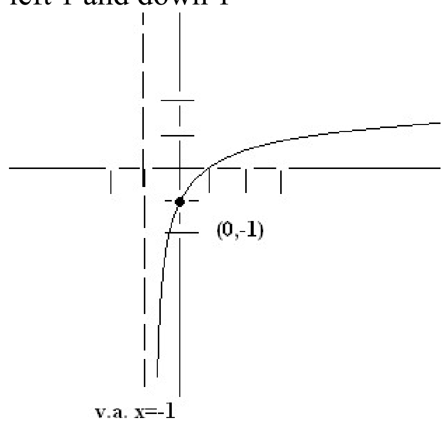
$(0, -1)$

c) Sketch $f(x)$ (label the reference point and any asymptotes).

original



left 1 and down 1



4. Let $f(x) = -e^{x-2} + 4$

a) Find the domain of $f(x)$. All real numbers

b) Find the x & y-intercept of $f(x)$.

x-int

$0 = -e^{x-2} + 4$

$-4 = -e^{x-2}$

$4 = e^{x-2}$

$\ln(4) = \ln(e^{x-2})$

$\ln(4) = x - 2$

$\ln(4) + 2 = x$

$(\ln(4) + 2, 0)$

y-int

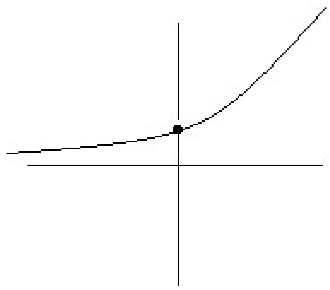
$y = -e^{0-2} + 4$

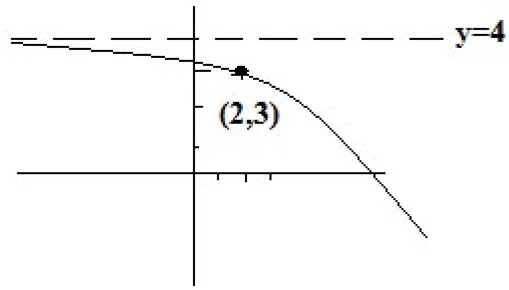
$y = -e^{-2} + 4$

$(0, -e^{-2} + 4)$

c) Sketch $f(x)$ (label the reference point and any asymptotes).

original | right 2, reflect x and up 3





5. Let $f(x) = 2x^3 + 3x^2 - 3x - 2$
   a) List the possible rational zeros of $f(x)$.

      $\frac{\pm 1, \pm 2}{\pm 1, \pm 2} = \pm 1, \pm \frac{1}{2}, \pm 2$
   b) Show that $x - 1$ is a factor of $f(x)$.

      1| 2 3 -3 -2
      2 5 2
      ----
      2 5 2 |0 remainder = 0
   c) Factor $f(x)$ completely.

      $f(x) = (x-1)(2x^2 + 5x + 2) = (x-1)(2x+1)(x+2)$

6. Let $f(x) = -(x+1)^2(x-1)^2$
   a) Apply the leading coefficient test.

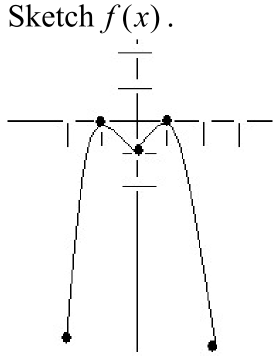
      n = 4, a_n = -1, so falls left and right
   b) Find the zeros of $f(x)$ and their multiplicity.

      x = -1, multiplicity 2, x = 1, multiplicity 2
   c) Plot sufficient solution points.

      $(-\infty, -1)$ $f(-2) = -9$

      $(-1, 1)$ $f(0) = -1$

      $(1, \infty)$ $f(2) = -9$
   d) Sketch $f(x)$.



7. Let $f(x) = \dfrac{2x+2}{x-1}$

a) Identify the x & y-intercepts.

x-int

$0 = 2x + 2$

$-2 = 2x$

$-1 = x$

$(-1,0)$

y-int

$y = \dfrac{2(0)+2}{0-1} = \dfrac{2}{-1} = -2$

$(0,-2)$

b) Find all asymptotes (vertical, horizontal and slant).

v.a.: $x - 1 = 0$

$x = 1$

h.a. degree of numerator = denominator, so

$y = \dfrac{2}{1} = 2$

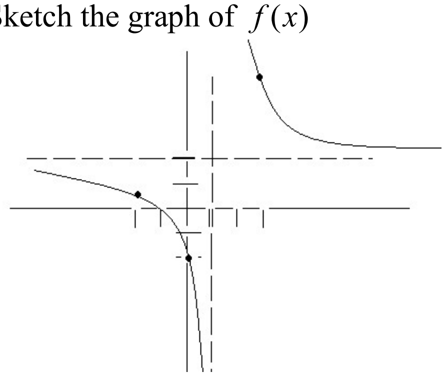
c) Plot sufficient solution points.

$(-\infty,-1)$ $f(-2) = 2/3$

$(-1,1)$ $f(0) = -2$

$(1,\infty)$ $f(2) = 6$

d) Sketch the graph of $f(x)$



8. Solve for x.

a) $4^{x-3} = 16$

$4^{x-3} = 4^2$

$x - 3 = 2$

$x = 5$

b) $\ln(3x-2)=0$

$e^{\ln(3x-2)}=e^0$

$3x-2=1$

$3x=3$

$x=1$

c) $e^{2x}-5e^x+4=0$

$(e^x-4)(e^x-1)=0$

$e^x-4=0$	$e^x-1=0$
$e^x=4$	$e^x=1$
$\ln(e^x)=\ln 4$	$\ln(e^x)=\ln 1$
$x=\ln 4$	$x=0$

d) $2\log_4 x=\log_4(2x)+\log_4(x-1)$

$\log_4 x^2=\log_4(2x)(x-1)$

$x^2=(2x)(x-1)$

$x^2=2x^2-2x$

$0=x^2-2x=x(x-2)$

$x=0, x=2$

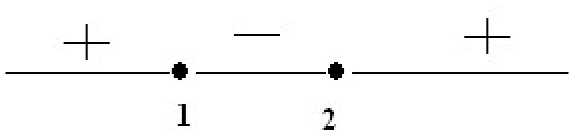
ln can't be zero, so only x = 2 works.

9. Solve $x^2-3x+2\le 0$

$(x-2)(x-1)\le 0$

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

$x=2, x=1$



$(-\infty,1)$ $f(0)=3$

$(1,2)$ $f(3/2)=9/4-9/2+2=9/4-18/4+8/4=-1/4$

$(2,\infty)$ $f(3)=9-9+2=2$

Solution: [1,2]