Math 126
Exam 4
Fall 15

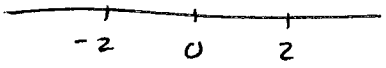
Name Key

Show All Work
NO GRAPHING CALCULATORS

1) Sketch the graph of $f(x) = x(x+2)^2(x-2)$. Make sure your graph shows all intercepts and exhibits the proper end behavior.

x-intercepts

$x = 0,\ x = -2,\ x = 2$

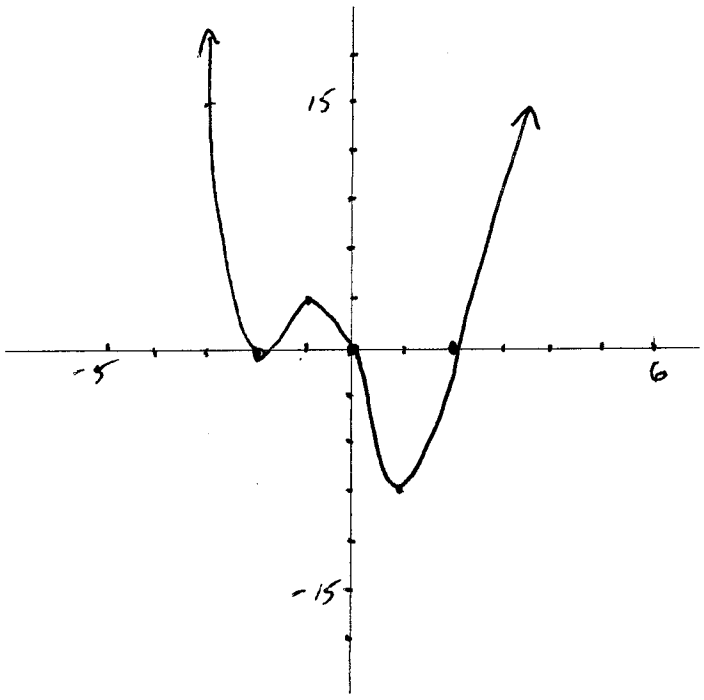


$f(-3) = 15$

$f(-1) = 3$

$f(1) = -9$

$f(3) = 75$



2) Find the quotient and remainder using long division. $\frac{x^3+2x+3}{x+4}$

$$x+4 \overline{)\, x^3 + 2x + 3}$$

$x^2 - 4x + 18$

$x^3 + 4x^2$

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

$-4x^2 - 16x$

$18x + 3$

$18x + 72$

-69

Q: $x^2 - 4x - 18$

R: -69

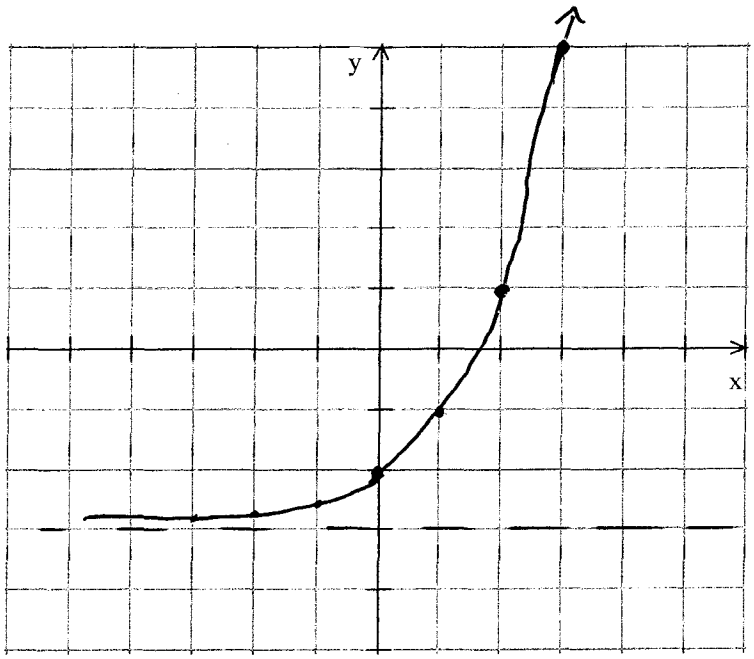
3) Find the vertical and horizontal asymptotes of the following function.

$R(x) = \frac{(x+4)(x-3)}{(x+2)(x-1)}$

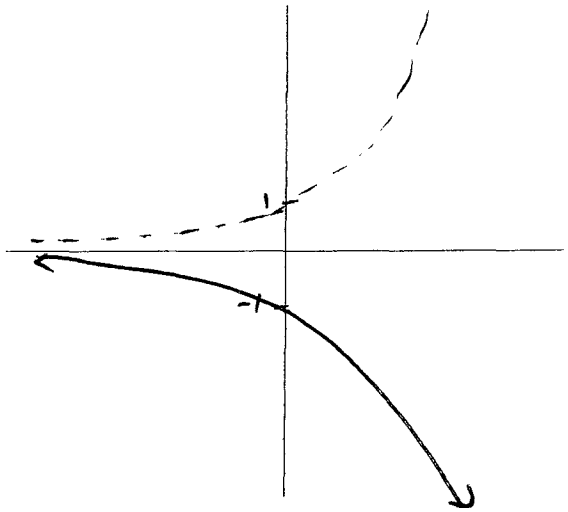
V: $x = -2$ $x = 1$

H: $y = 1$

4) Graph $f(x) = 2^x - 3$



5) Sketch the graph of $f(x) = -e^x$



6) A radioactive substance decays in such a way that the amount of mass remaining after t days is given by the function $m(t) = 12e^{-0.15t}$ where *m(t)* is measured in kilograms.

a) Find the mass at time t = 0

$m(0) = 12 \cdot 1 = 12$

b) How much of the mass remains in 10 days?

$m(10) = 12 \cdot e^{(-0.15)(10)} = 12e^{-1.5} \approx 2.67756\ldots$

7) Use the definition of the logarithmic function to find x.

a) $\log_3 27 = x$

$3^x = 27 \qquad x = 3$

b) $\log_x 25 = 2$

$x^2 = 25 \qquad x = 5$

8) Find $\log_3 20$ correct to 5 decimal places.

$\frac{\ln 20}{\ln 3} \approx 2.72683$

9) What is the domain of f(x) = ln(5 - x) ?

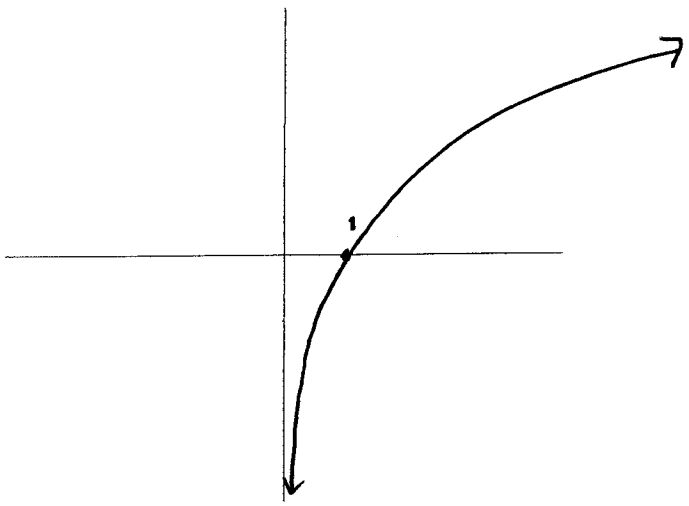
$5 - x > 0$

$5 > x$

$x < 5$

$(-\infty, 5)$

9) Sketch the graph of $f(x) = \ln x$



10) Solve the following equations

a) $3^{2x-1} = 5$

$\ln 3^{2x-1} = \ln 5$

$(2x-1)\ln 3 = \ln 5$

$2x\ln 3 - \ln 3 = \ln 5$

$2x\ln 3 = \ln 5 + \ln 3$

$x = \dfrac{\ln 5 + \ln 3}{2\ln 3}$

b) $5^{x-1} = 2^{x+4}$

$\ln 5^{x-1} = \ln 2^{x+4}$

$(x-1)\ln 5 = (x+4)\ln 2$

$x\ln 5 - \ln 5 = x\ln 2 + 4\ln 2$

$x\ln 5 - x\ln 2 = \ln 5 + 4\ln 2$

$x(\ln 5 - \ln 2) = \ln 5 + 4\ln 2$

$x = \dfrac{\ln 5 + 4\ln 2}{\ln 5 - \ln 2}$

or simplify

$x = \dfrac{\ln 5 + \ln 16}{\ln 5/2}$

$= \dfrac{\ln 80}{\ln(5/2)}$

c) $\log 6x - \log(x-1) = 1$

$\log\left(\dfrac{6x}{x-1}\right) = 1$

$\dfrac{6x}{x-1} = 10^1$

$6x = 10(x-1)$

$6x = 10x - 10$

$-4x = -10$

$x = \dfrac{5}{2}$