1) (25 pts) If you have 100m of fencing and want to fence in a rectangular area on three sides (the fourth side is enclosed by a river) what is the largest area you can enclose?

If the width (the length of the side in the direction of the river) is \( w \) and the depth is \( d \) then the limitation is \( w + 2d = 100 \).

Solve this for \( w \) to get \( w = 100 - 2d \)

The area enclosed is \( A = wd \)

Plug in to get \( A = d(100 - 2d) = -2d^2 + 100d \)

The roots are \( d = \{0, 50\} \) (or, put in other words, \( A = -2d(d-50) \))

To find the vertex (the minimum) complete the square:

\[
A = -2d^2 + 100d = -2(d^2 - 50) = -2(d-25)^2 + 225
\]

So the largest area you can enclose is 225 m\(^2\), gotten when \( d = 25 \) and \( w = 50 \).

2) (30 pts) Graph \( y = \frac{2x^2 - 6x + 4}{x^2 - 3x} \). Include and label:
   i) zeros (x-intercepts)
   ii) y-intercept
   iii) vertical asymptotes
   iv) horizontal asymptotes (if any)
3) (25 pts) Solve for $x$ if $2^{(3x-5)} = 16$.
First we note that $16 = 2^4$, so $2^{(3x-5)} = 2^4$.
And taking logarithms (base 2) we get $3x - 5 = 4$
so $x = 3$.

4) (20 pts) Match each function with its graph:
1) $y = e^x$ (graph d)
2) $y = 5^x$ (graph b - note that $5 > e$ so for $x > 0$ this is greater than fcn (1))
3) $y = 3e^x$ (graph a - this fcn should cross the y-axis at $y = 3$)
4) $y = x^3 + 1$ (graph c - for $x < 0$ this fcn goes towards negative infinity)
5) $y = \ln(x) + 1$ (graph e - $\ln$ has a vertical asymptote at $x = 0$)