50 (b):

$$e^{2x} - 3e^{x} + 2 = 0$$

substitute $e^x$ by $t$, i.e. Let $t = e^x$, then

$$t^2 - 3t + 2 = 0 \qquad (\text{Here } e^{2x} = (e^x)^2)$$

So $t = 1$ or $t = 2$

i.e. $e^x = 1$ or $e^x = 2$ $\Rightarrow$ $x = \ln 1 = 0$

or $x = \ln 2$

Solution: $\underline{x = 0}$ or $\underline{x = \ln 2}$

56. $f(x) = \ln(2 + \ln x)$

For the domain of $f$: $\begin{cases} \ln x + 2 > 0 \\ x > 0 \end{cases}$ $(*)$

solve $(*)$ as follows: $\ln x + 2 > 0 \Rightarrow \ln x > -2 \Rightarrow x > e^{-2}$.

So $D = (e^{-2}, +\infty) \cap (0, +\infty) = \underline{(e^{-2}, +\infty)}$

the inverse function: $y = \ln(2 + \ln x)$

$$e^y = 2 + \ln x$$

$$e^y - 2 = \ln x.$$

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

So $\underline{f^{-1}(y) = e^{e^y - 2}}$, $\underline{\text{the domain for } f^{-1} \text{ is } (-\infty, +\infty)}$.

4. Solve the inequalities:

a) $x^2 - 4x + 5 > 0$.

recall: $\Delta = b^2 - 4ac$.

So $\Delta = (-4)^2 - 4 \times 1 \times 5 = -4 < 0$.

there is no real root!

So for ~~the~~ quadratic function,

the picture would either be "$\cup$" or "$\cap$" when $\Delta < 0$. And the case just depends on the leading coefficient, i.e. "$a$". In this case, it would be the first case since $1 > 0$. So the solution for inequalities would be $(-\infty, +\infty)$.

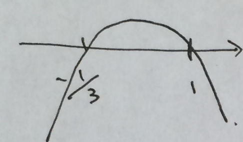
b). $-3x^2 + 2x + 1 \le 0$.

$\Delta = 2^2 - 4 \times (-3) \times 1 = 16$.

So $x_{1,2} = \frac{-2 \pm \sqrt{\Delta}}{2 \times (-3)}$

So $x_1 = -\frac{1}{3}$ $x_2 = 1$.

Thus we have. the following picture:




the parabola opens downward since $-3 < 0$.

So the ~~interval we~~ solution would be

$(-\infty, -\frac{1}{3}] \cup [1, +\infty)$

( There is another way to de~~term~~termin the solution set after solving the equation: Just plug in some numbers in each interval to see ~~if~~ the inequality holds.

For instance, take $x = 0 \in (-\frac{1}{3}, 1)$.

"$1 \le 0$" does not hold. So the interval is not in the solution. You can try the other two intervals)