5.1)

a) $\mathcal{F}^*(2, 4, -3, 3)$

b) i) 0.11_{10} $\qquad$ $- \; 0.0001110 \cdot 2^0_{(2)} = 1.110 \cdot 2^{-4}_{(2)}$

$$
\begin{aligned}
0.11 \cdot 2 &= 0.22 & 0 \\
0.22 \cdot 2 &= 0.44 & 0 \\
0.44 \cdot 2 &= 0.88 & 0 \\
0.88 \cdot 2 &= 1.76 & 1 \\
0.76 \cdot 2 &= 1.52 & 1 \\
0.52 \cdot 2 &= 1.04 & 1 \\
0.04 \cdot 2 &= 0.08 & 0
\end{aligned}
$$

but max: 2^3

$\Rightarrow 0.11_{10} = 1.000 \cdot 2^{-3}_{(2)}$

for $\mathcal{F}^*(2, 4, -3, 3)$

ii) 3.1416_{10} $\qquad$ $= 11.001001_2 = 1.1001001 \cdot 2^1$

$$
\begin{aligned}
0.1416 \cdot 2 &= 0.2832 & 0 \\
0.2832 \cdot 2 &= 0.5664 & 0 \\
0.5664 \cdot 2 &= 1.1328 & 1 \\
0.1328 \cdot 2 &= 0.2656 & 0 \\
0.2656 \cdot 2 &= 0.5312 & 0 \\
0.5312 \cdot 2 &= 1.0624 & 1
\end{aligned}
$$

$3.1416_{10} \approx 1.101 \cdot 2^1$

for $\mathcal{F}^*(2, 4, -3, 3)$

iii) 2.718_{10} $\qquad$ $- \; 10.10 11_2 = 1.011 \cdot 2^1$

$$
\begin{aligned}
0.718 \cdot 2 &= 1.436 & 1 \\
0.436 \cdot 2 &= 0.872 & 0 \\
0.872 \cdot 2 &= 1.744 & 1 \\
0.744 \cdot 2 &= 1.488 & 1 \\
0.488 \cdot 2 &= 0.976 & 0
\end{aligned}
$$

iiii) $7_{10} = 111 \cdot 2^0_2 = 1.11 \cdot 2^2_2$

c) i) $1.000 \cdot 2^{-3}_2 = 0.125_{10}$ $\qquad$ $\dfrac{0.125 - 0.11}{0.11} \approx 14\%$

ii) $1.101 \cdot 2^1_2 = 3.25_{10}$ $\qquad$ $\dfrac{3.25 - 3.1416}{3.1416} \approx 3.5\%$

iii) $1.11 \cdot 2^2_2 = 7_{10}$ $\qquad$ $\dfrac{7-7}{7} = 0\%$

iiii) $1.011 \cdot 2^1_2 = 2.75_{10}$ $\qquad$ $\dfrac{2.75 - 2.718}{2.718} \approx 1.18\%$

d)

$$1{,}011 \cdot 2_2^1 + 1{,}101 \cdot 2_2^1 + 1{,}000 \cdot 2_2^{-3} =$$

$$= 1{,}000 \cdot 2_2^1 + 0{,}0001 \cdot 2_2^1 = 1{,}100 \cdot 2_2^2 = 6_{10}$$

$\Rightarrow 0{,}11_{10}$ is too small so it does not contribute to the solution

5.3)

a) missing return statement if criteria is not met

→ add return false at the end of the method

b) if x is nott zero the output is unpredictable.

→ initialize result with zero or set Precondition $x \neq 0$