1. $\frac{1}{n+1} \leq \frac{15}{100}$

or, $n \geq 6$

1.

2. Since the initial interval of uncertainty is $(0,1)$,

$$L_0 = 1.$$

So, $x_1 = \frac{L_0}{2} - \frac{\delta}{2} = 0.5 - 0.0005 = 0.4995$

$x_2 = \frac{L_0}{2} + \frac{\delta}{2} = 0.5 + 0.0005 = 0.5005$

Then, $f_1 = f(x_1) = 0.25100075$

$f_2 = f(x_2) = 0.24900075$

As, $f_1 > f_2$, the new interval of uncertainty is $(0.4995, 1)$.

$x_3 = x_1 + \frac{1}{2}(L_2 - \delta)$, where $L_2 = 0.5005$

$= 0.74925$

$x_4 = b - \frac{1}{2}(L_2 - \delta)$, where $b = 1$

$= 0.75025$

Then, $f_3 = f(x_3) = -0.0621$

$f_4 = f(x_4) = -0.0626$

Since, $f_4 < f_3$, the new interval of uncertainty is

$(0.74925, 1)$

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3. In case of interval halving method, for this problem
$a = 0,\ b = 1 \Rightarrow L_0 = 1$

So, $x_1 = 0.25$, $x_0 = 0.50$, $x_2 = 0.75$

Then, $f_1 = f(x_1) = -0.3125$

$f_0 = -0.5$

$f_2 = -0.5625$

Since, $f_1 > f_0 > f_2$, we delete the interval $(a, x_0) = (0, 0.5)$.

Now, we label x_2 and x_0 as the new x_0 and a

so, $a = 0.5$

$x_0 = 0.75$

$b = 1$.

Now, the new interval of uncertainty is $L_3 = (0.5, 1)$

$x_1 = 0.625$, $f_1 = -0.546875$

$x_0 = 0.750$, $f_0 = -0.562500$

$x_2 = 0.875$, $f_2 = -0.546875$

Since $f_1 > f_0$ and $f_2 > f_0$, we delete both the intervals (a, x_1) and (x_2, b).

We label x_1, x_0 and x_2 as the new a, x_0 and b respectively.

Thus the new interval of uncertainty will be $L_5 = (0.625, 0.875)$

$x_1 = 0.6875, \quad x_0 = 0.75, \quad x_2 = 0.8125$

$f_1 = -0.558594$

$f_0 = -0.5625$

$f_2 = -0.558594$

Again we note that $f_1 > f_0$ and $f_2 > f_0$ and hence we delete both the intervals (a, x_1) and (x_2, b).

Thus, the new and required level of uncertainty is

$$L_7 = (0.6875, 0.8125)$$

4. Self-Explanatory
5. Self-Explanatory

6. $f(x) = -x^2 + 21.6x + 3$

Here $n = 6$ and $L_0 = 20$ which yield

$$L_2^* = \frac{F_{n-2}}{F_n} L_0 = \frac{5}{13} \times 20 = 7.692$$

Then the positions of the first two experiments are given by

$x_1 = 7.692$ with $f_1 = f(x_1) = 109.98$

and $x_2 = 20 - x_1 = 12.308$ with $f_2 = 117.366$.

Here, $f_1 < f_2$, so we can delete $[x_2, 20]$.

The new interval of uncertainty is $[0, 12.308]$.

The third experiment is placed at $x_3 = 0 + (x_2 - x_1) = 4.616$

Here $f_3 = f(x_3) = 81.398$

Hence, we may discard $[7.692, 12.308]$ and hence, the new and required interval of uncertainty is $(0, 7.692)$.

6.
7. Self-Explanatory

Week-2

Region Elimination 1

1. What is the minimum number of subintervals to get 15% accuracy in exhaustive search
    a. 6
    b. 9
    c. 8
    d. 11

2. What is the interval of uncertainty after 2nd iteration in Dichotomous search $Min\ f = 3x^2 - 5x + 2$ in the interval (0.0,1.00). Use $\delta = 0.001$.
    a. (0.4995,.75025)
    b. (0.4995,0,5005)
    c. (0.74925,1)
    d. (0.4995,1)

3. What is the interval of uncertainty after 3rd iteration in interval halving method for Min $f(x) = x(x - 1.5)$ in interval (0,1).

    a. (0,0.1250)
    b. (0.6875,0.812)
    c. (0.8125,1)
    d. none of the above

4. The value of γ in golden section method is
    a. 1.600
    b. 0.618
    c. 0
    d. 1.618

5. The reduction ratio in internal halving method is
    a. $(\frac{1}{2})^{\frac{(n)}{2}}$
    b. $(\frac{1}{2})^{\frac{(n-1)}{2}}$
    c. $(\frac{n}{2})^{\frac{(n-1)}{2}}$
    d. none of the above

6. Find the interval of uncertainty after 2nd iteration by Fibonacci method for following function:
   $minimize\ f(x) = -x^2 + 21.6x + 3$ for the interval $[0,20]$ using $n = 6$

   a) (0,7.692)
   b) (12.308,20)
   c) (0.7692,12.308)
   d) $none\ of\ the\ above$

7. Find the optimal solution in fixed step search method for the function:
   $$f(x) = x(x-4), x \in [0,4]$$
   take $\lambda = .1$, initial guess point as $x = 1$.

   a) 2.68
   b) 3.94
   c) 4.28
   d) 4