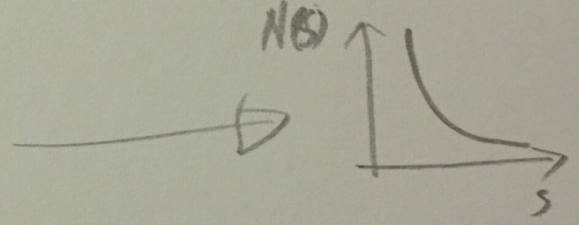
A. 37.

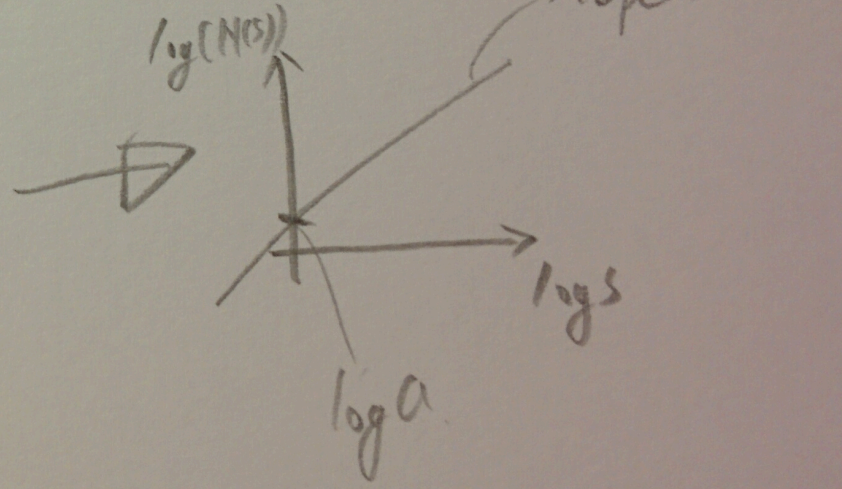
$$N(s) = a \frac{1}{s^\alpha}$$



$$\log N(s) = \log\left(a \cdot \frac{1}{s^\alpha}\right)$$

$$= \log a + \log s^{-\alpha}$$

$$= \log a + -\alpha \cdot \log s$$



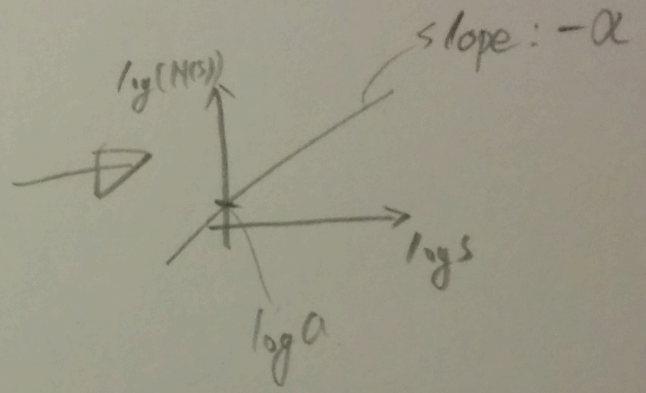
A. 38. $N(s) = a \cdot \frac{1}{s^\alpha}$

$$N(k \cdot s) = a \cdot \frac{1}{(k \cdot s)^\alpha} = a \cdot k^{-\alpha} \cdot \frac{1}{s^\alpha} = a \cdot k^{-\alpha} \cdot N(s)$$

$\log N(s) = \log\left(a \cdot \frac{1}{s^{\alpha}}\right)$

$= \log a + \log s^{-\alpha}$

$= \log a + -\alpha \cdot \log s$



A.38. $N(s) = a \cdot \frac{1}{s^{\alpha}}$

$N(k \cdot s) = a \cdot \frac{1}{(ks)^{\alpha}} = a \cdot k^{-\alpha} \cdot \frac{1}{s^{\alpha}} = a \cdot k^{-\alpha} \cdot N(s)$ ⇒ scale invariant

· $f(x) = x^n$

$f(k \cdot x) = (k \cdot x)^n = k^n \cdot x^n = k^n \cdot f(x)$ ⇒ scale invariant

A.41. RS, RO

Common : · numerical optimization that does not require the gradient of the

functions not continuous or differentiable

$N(k \cdot s) = a \cdot \frac{}{(ks)^{\alpha}} = a \cdot k^{} \cdot s^{\alpha}$

$f(x) = x^n$

$f(k \cdot x) = (k \cdot x)^n = k^n \cdot x^n = k^n \cdot f(x)$ ⇨ scale invariant

A.41. RS, RO

Common : • numerical optimization that does not require the gradient of the problem.

• used on functions not continuous or differentiable

• iteratively moving to better position in the search-space

• y : new position sample, x : current position → if $f(y) < f(x)$, move to the new position by setting $x = y$

Differences : •

RS	RO
sampling : hypersphere surrounding current position	normal distribution surrounding current position

~~• y : new position sample~~

A.42 $P_{step} = \mu^{n} \cdot P_0$ (~~where~~ P_{step} is Pheromone concentration after n step)

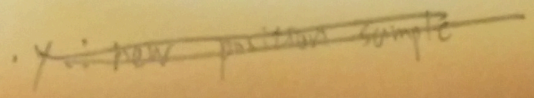
$n = 42$, $P_0 = 1$, $P_{42} = 0.1$

A.41 RS, RO

Common
- numerical optimization that does not require the gradient of the problem
- used on functions not continuous or differentiable
- iteratively moving to better position in the search-space
- y: new position sample, x: current position → if $f(y) < f(x)$, move to the new position by setting $x = y$

Differences:

	RS	RO
sampling	hypersphere surrounding current position	normal distribution surrounding current position



A.42 $P_{step^n} = \mu^n \cdot P_0$ (Pstep is Pheromone concentration after n step)

$n = 42$, $P_0 = 1$, $P_{42} = 0.1$

$\Rightarrow \mu \approx 0.946$