Let: $p = \#\text{variables} = \#\text{pixels in image} = \underset{\text{hight}}{n} * \underset{\text{width}}{m}$

$\#$ flops per vector norm $= p + p = 2p \rightarrow O(p)$

$$\|\underset{p\times 1}{x}\|_2^2 = x^T x$$

$\#$ flops per matrix-vector multiplication $= p \cdot (p+p) = 2p^2 \rightarrow O(p^2)$

$$\underset{p\times p}{D}\,\underset{p\times 1}{x} = \underset{p\times 1}{c}$$

$\#$ flops per vector addition $= p = O(p)$

$$\underset{p\times 1}{x} + \underset{p\times 1}{y} = \underset{p\times 1}{z}$$

$\therefore$ $\#$ flops per denoising objective function evaluation $= \underset{Dx}{p^2} + \underset{\|Dx\|}{p} + \underset{x - z_n}{p} + \underset{\|x - z_n\|}{p} = O(p^2)$

$\#$ flops per denoising objective function gradient evaluation $= p^2 + p = O(p^2)$

$\#$ flops pe denoising objective function Hessian evaluation $= p^2 + p^2 = O(p^2)$

$\rightarrow$ We can now describe worst case flops for Armijo line search + gradient descent as:

$$\#\text{Flops} = \underset{Q_{10}}{\boxed{\begin{array}{c}\text{Worst case}\\ \text{iteration}\\ \text{Complexity}\\ \text{for G.D.}\\ O(\log(1/\varepsilon))\end{array}}} * \Bigg[\overset{\nabla f(x) = p^2}{\begin{array}{c}\#\text{ flops}\\ \text{per grad.}\\ \text{evaluation}\end{array}} + \overset{\|\nabla f(x)\| = p}{\begin{array}{c}\#\text{ flops}\\ \text{per norm}\\ \text{evaluation}\end{array}} + \underset{Q8}{\boxed{\begin{array}{c}\frac{\log(L/(1-\gamma))}{\log 2}\\ \text{Worst case}\\ \text{iteration}\\ \text{Complexity}\\ \text{for Armijo}\end{array}}} * \left[\overset{\overset{= p}{x - \alpha_i \nabla f(x)}}{\begin{array}{c}\#\text{ flops}\\ \text{per subtraction}\end{array}} + \overset{\overset{= p^2}{f(x - \alpha_i \nabla f(x))}}{\begin{array}{c}\#\text{ Flops}\\ \text{per function}\\ \text{evaluation}\end{array}} \right] + \underset{= p}{\begin{array}{c}\#\text{ flops}\\ \text{value}\\ \text{update}\\ x_{k+1} = x_k - \alpha \nabla f(x)\end{array}} \Bigg]$$

$$\therefore O(\log(1/\varepsilon)) * \left(p^2 + p + \frac{\log(L/(1-\gamma))}{\log 2}(p + p^2) + p\right)$$

$$\boxed{= O(\log(1/\varepsilon) + p^2) \longrightarrow \text{in Big-O notation}}$$