

Written problem

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a)

b)

c)

source: $(p_s, q_s) = (0, 0)$

$$E(x, y) = R(p, q) = \frac{1}{\sqrt{p^2 + q^2 + 1}}$$

$\therefore \sum A = 1 \therefore p_A = q_A = 0$

and $q_B = q_A = 0$

$$\therefore \sum B = \frac{1}{\sqrt{p_B^2 + q_B^2 + 1}} = \frac{1}{\sqrt{5}} \therefore p_B = 2$$

and $p_C = p_A = 0$

and $Ac = \frac{\sqrt{3}}{3} AB = \frac{\sqrt{3}}{3} (p_A - p_B) = -\frac{2}{3} \sqrt{3}$

$\therefore q_C = q_A + Ac = 0 + \frac{2}{3} \sqrt{3} = \frac{2}{3} \sqrt{3}$

$$\therefore E_C = \frac{1}{\sqrt{p_C^2 + q_C^2 + 1}} = \frac{1}{\sqrt{0 + (\frac{2}{3} \sqrt{3})^2 + 1}} = \frac{\sqrt{2}}{7}$$

Computer Problem:

1. deriving the normal
 $z = z_0 + \sqrt{r^2 - (x^2 + y^2)}$

$$p = \frac{\partial z}{\partial x} = \frac{-x}{\sqrt{r^2 - (x^2 + y^2)}}$$

$$q = \frac{\partial z}{\partial y} = \frac{-y}{\sqrt{r^2 - (x^2 + y^2)}}$$

$$p^2 + q^2 + 1 = \frac{x^2 + y^2 + r^2 - (x^2 + y^2)}{r^2 - (x^2 + y^2)} = \frac{r^2}{r^2 - (x^2 + y^2)}$$

$$N = \frac{(-p, -q, 1)}{\sqrt{p^2 + q^2 + 1}} = \frac{\left(\frac{x}{\sqrt{r^2 - (x^2 + y^2)}}, \frac{y}{\sqrt{r^2 - (x^2 + y^2)}}, 1\right)}{\frac{r}{\sqrt{r^2 - (x^2 + y^2)}}} = \left(\frac{x}{r}, \frac{y}{r}, \frac{\sqrt{r^2 - (x^2 + y^2)}}{r}\right)$$

2.

effect: S : same of light

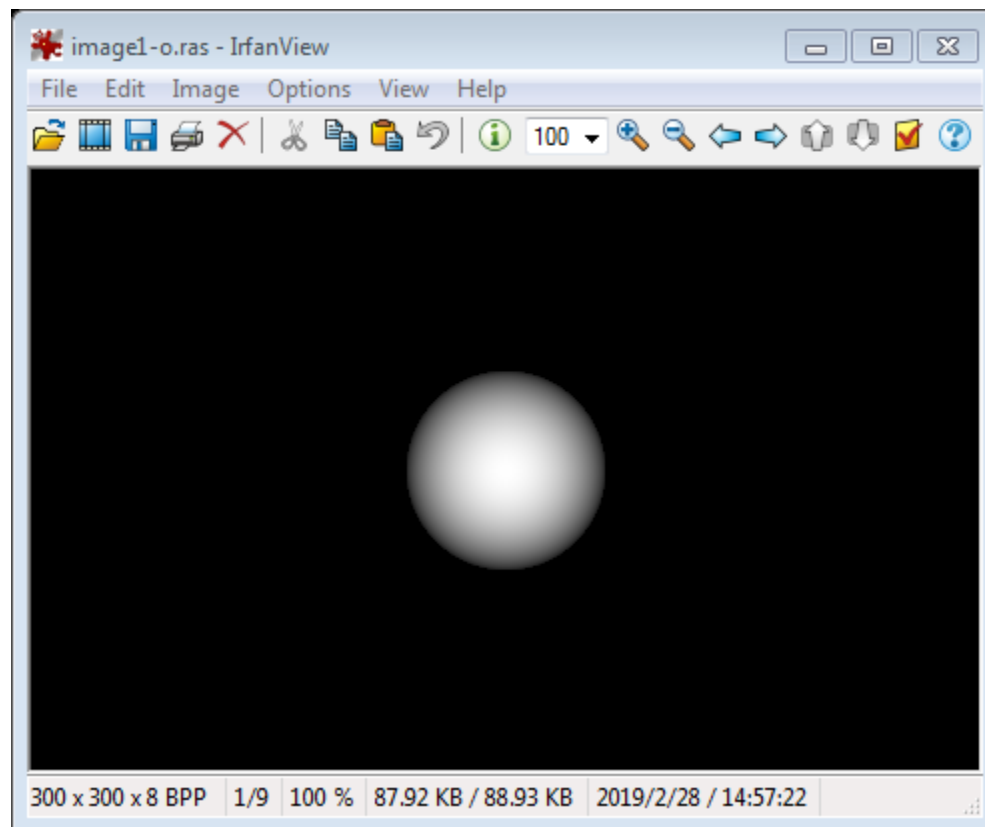
m : surface roughness that affects specular reflection

a : weight combining the Lambertian and specular reflection

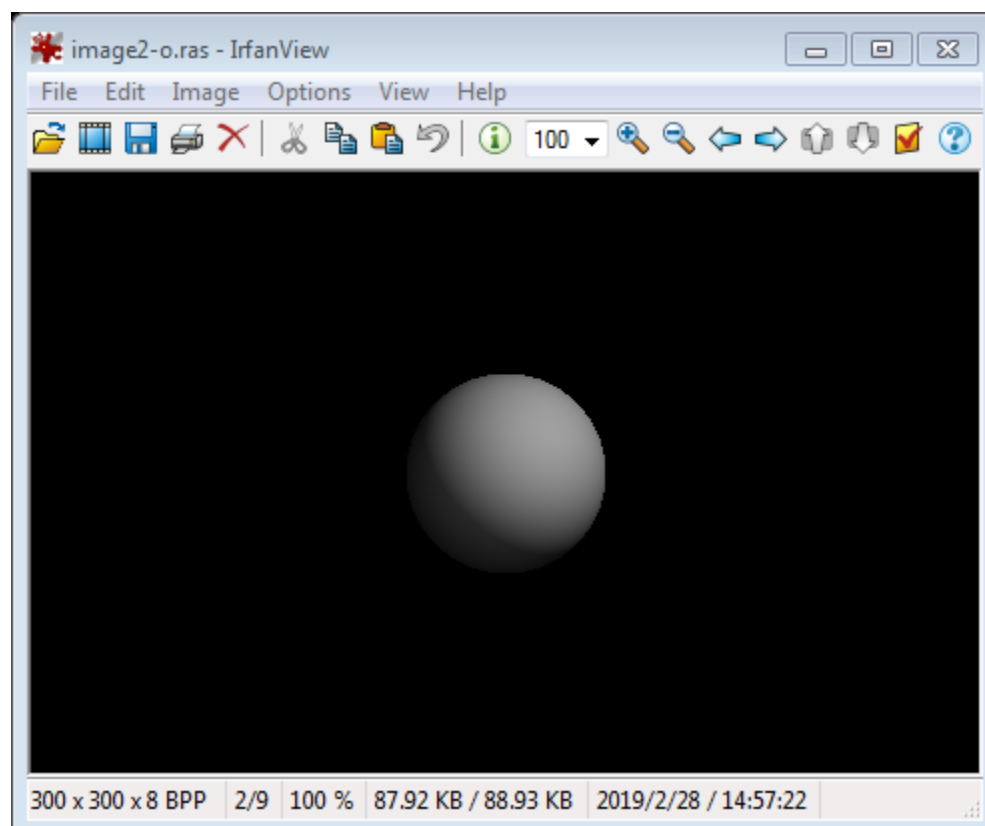
r : size of object that can radiance

The images:

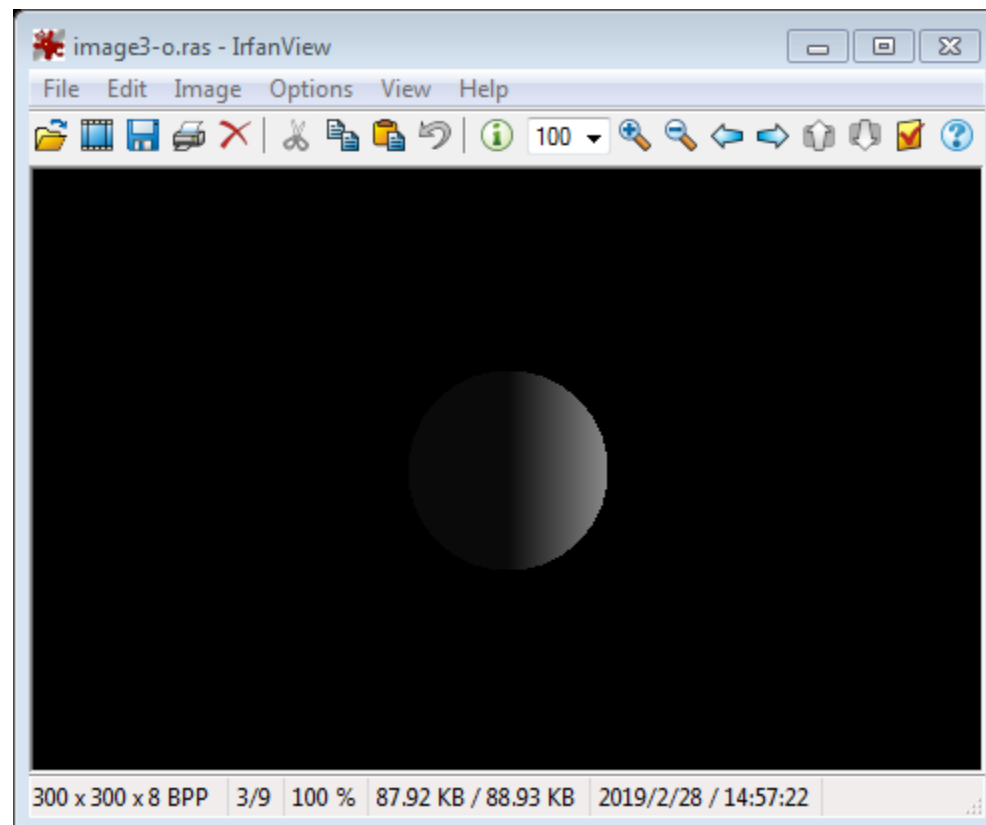
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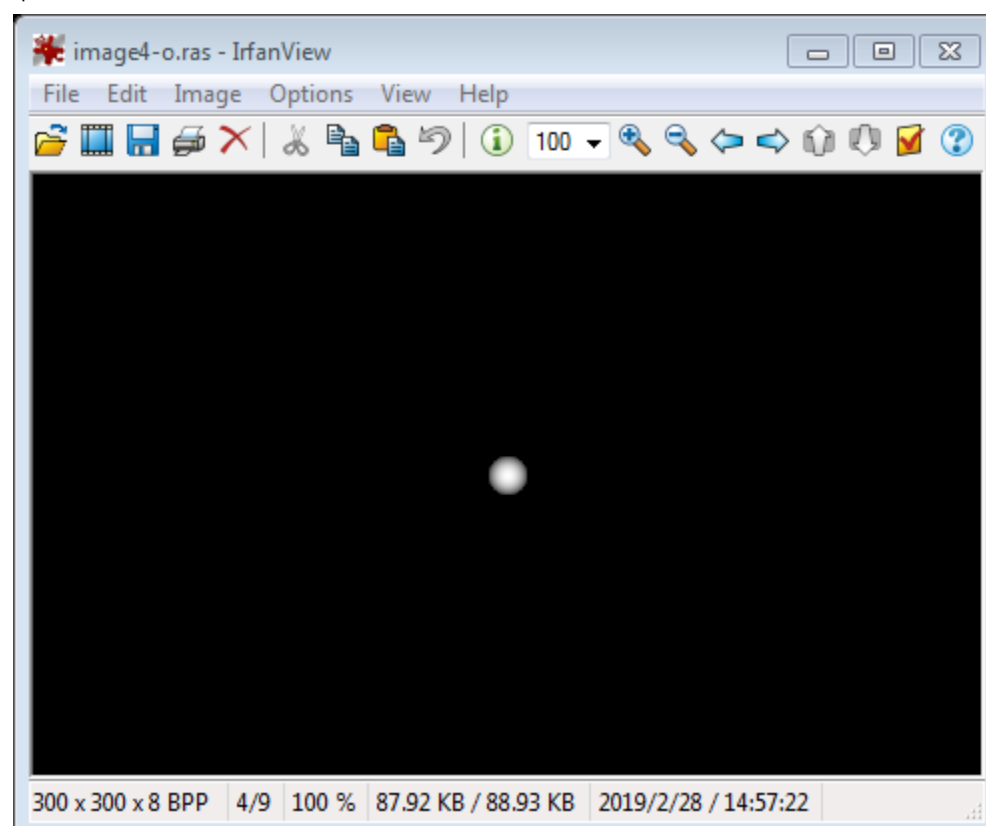
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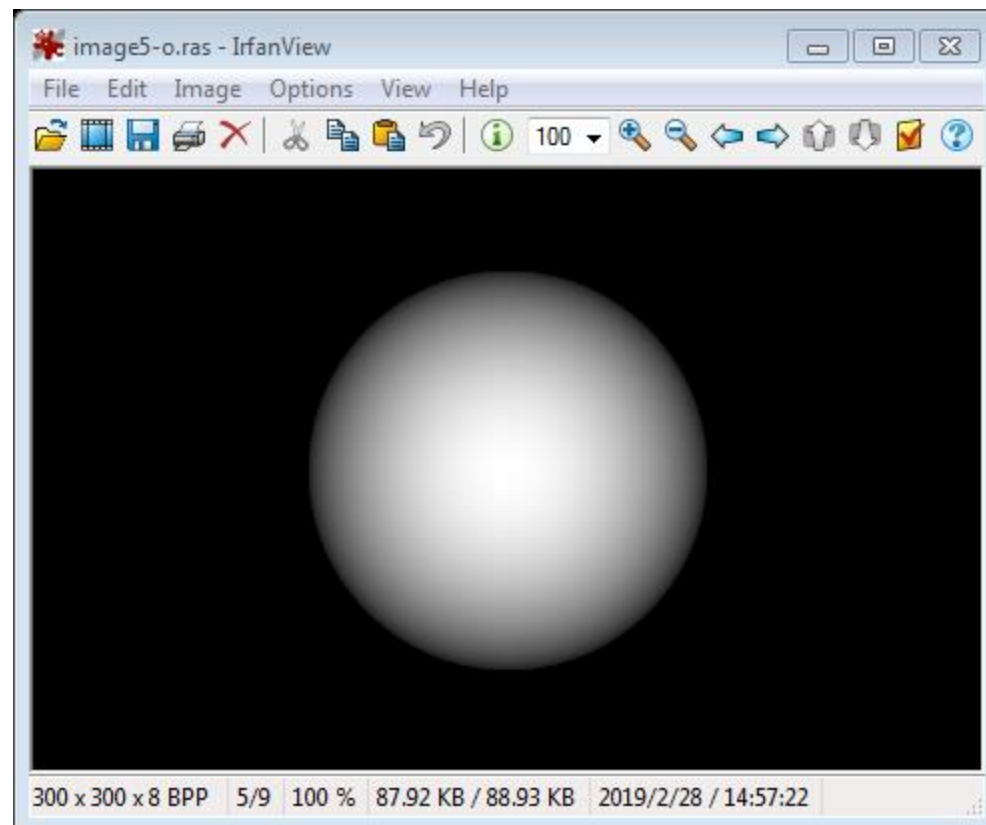
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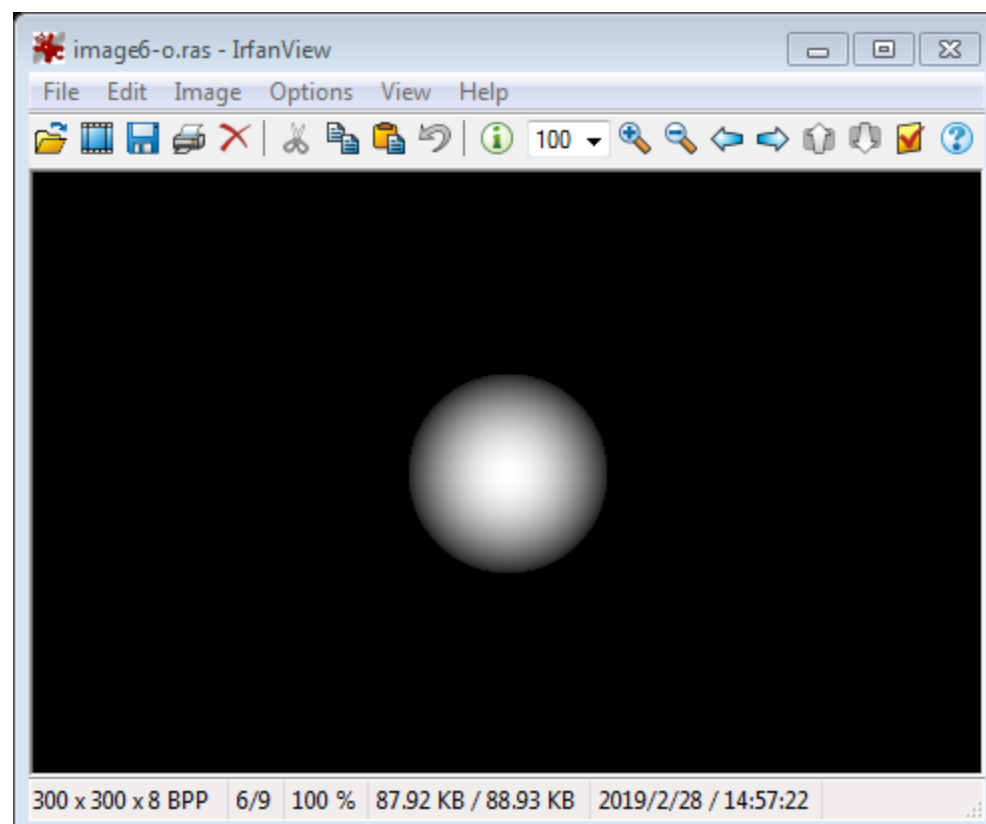
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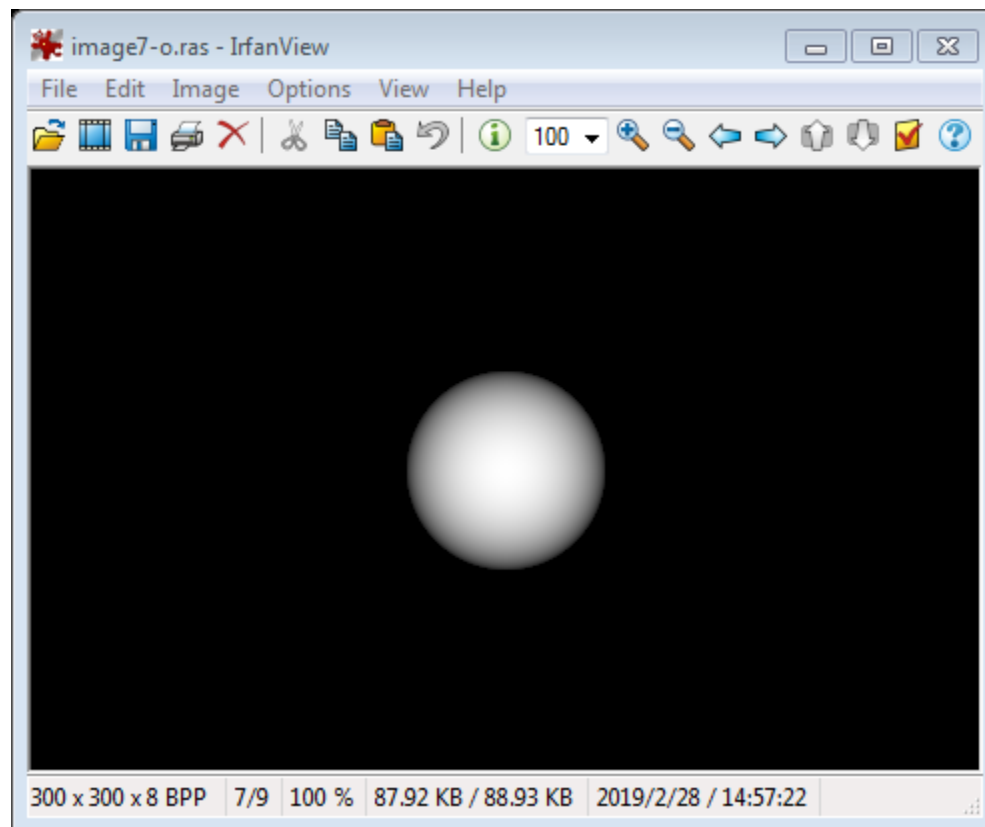
5



6



7



8

