$$\lim_{n\to\infty}\frac{f(n)}{g(n)} = \lim_{n\to\infty}\frac{9\cancel{n}}{5n^{\cancel{3}2}} = 0$$

so $f \in o(g)$ holds.

$$\lim_{n\to\infty}\frac{f(n)}{g(n)} > 0 \quad \lim_{n\to\infty}\frac{9\cancel{n}}{5n^{\cancel{3}2}} = 0$$

~~so f is not ... $f \notin \Theta(g)$)~~

so $f \in \Omega(g)$ does not hold

$$\lim_{n\to\infty}\frac{f(n)}{g(n)} \lim_{n\to\infty}\frac{9n}{5n^3} = 0 \neq \infty$$

so $f \in \omega(g)$ does not hold.

$- \; g \in \Theta(f)$

$g = cf(n) \qquad c_1, c_2 > 0,\ n_0 < n$

$c_1 9n_0 \leq 5n_0^3 \leq c_2 9n_0$

$\cancel{c_1 9n_0 \leq 5n_0 \times (9n_0)^2 \leq c_2 9n_0}$

$\cancel{c_1 \leq \frac{5\times 81 n_0}{9} \ \& \ c_2 \geq 45n_0^2}$

$\cancel{c_1 \leq 45n_0^2}$

$$\lim_{n\to\infty}\frac{45n^3}{9n} = \infty$$ not strictly between 0 and ∞

$g \in \Theta(f)$ does not hold.