Math 234 BD6 Quiz 8 (4.1, 4.2) **Name (Last, First):** Solutions

You must show all your work to receive credit.

1.] (2 pts) Evaluate both expressions.

(a.) $\left(4^{2/3}\right)\left(2^{2/3}\right) = (4\cdot 2)^{2/3}$

$= 8^{2/3} = \left(8^{1/3}\right)^2 = \left(\sqrt[3]{8}\right)^2 = 2^2 = \boxed{4}.$

(b.) $\left(\frac{27}{8}\right)^{2/3}\left(\frac{16}{81}\right)^{-3/4}$

$= \frac{27^{2/3}}{8^{2/3}} \cdot \left(\frac{81}{16}\right)^{3/4}$

$= \frac{\left(\sqrt[3]{27}\right)^2}{\left(\sqrt[3]{8}\right)^2} \cdot \frac{81^{3/4}}{16^{3/4}} = \frac{3^2}{2^2} \cdot \frac{\left(\sqrt[4]{81}\right)^3}{\left(\sqrt[4]{16}\right)^3}$

$= \frac{3^2}{2^2} \cdot \frac{3^3}{2^3} = \frac{3^5}{2^5} = \frac{3\cdot 81}{32} = \boxed{\frac{243}{32}}$

2.] (2 pts) Evaluate both expressions.

(a.) $e^{3\ln(2)-2\ln(3)}$

$= e^{\ln(2^3)-\ln(3^2)}$

$= e^{\ln\left(\frac{2^3}{3^2}\right)} = \frac{2^3}{3^2}$

$= \boxed{\frac{8}{9}}.$

(b.) $\log_9\left(3^{20}\right)$

$= \log_9 (3^2)^{10} = \log_9 9^{10}$

$= 10\log_9(9) = 10\cdot 1 = 10.$

(or)

$\log_9(3^{20}) = 20\log_9 3 = 20\cdot\log_9(9^{1/2})$

$= 20\left(\frac{1}{2}\right) = 10.$

3.] (2 pts) Simplify both expressions (answer should have simple arguments).

(a.) $\ln\left(x^2\sqrt{4-x^2}\right)$

$= \ln(x^2) + \ln\left(\sqrt{4-x^2}\right)$

$= 2\ln x + \ln(4-x^2)^{1/2}$

$= 2\ln x + \frac{1}{2}\ln(4-x^2)$

$= 2\ln x + \frac{1}{2}\ln(2-x)(2+x)$

$= 2\ln x + \frac{1}{2}\left[\ln(2-x) + \ln(2+x)\right].$

(b.) $\left(\frac{1}{y^{5/4}}\right)^{-4/5} = \left(\frac{y^{5/4}}{1}\right)^{4/5}$

$= y^{\frac{5}{4}\cdot\frac{4}{5}}$

$= y^1 = \boxed{y}.$

4.] (2 pts) Find all real numbers x that satisfy the equation.

$$3^{2x-1} = 9$$

$$3^{2x-1} = 3^2$$

$$2x-1 = 2$$

$$2x = 3$$

$$\underline{x = \frac{3}{2}}$$

5.] (2 pts) Solve the equation for x; simplify your answer.

$$4 = 3 + 9e^{-2x}$$

$$1 = 9e^{-2x}$$

$$\frac{1}{9} = e^{-2x}$$

$$\ln\left(\frac{1}{9}\right) = \ln\left(e^{-2x}\right)$$

$$\ln\left(\frac{1}{9}\right) = -2x$$

$$\frac{\ln\left(\frac{1}{9}\right)}{-2} = x$$

$$= -\frac{1}{2}\ln\left(\frac{1}{9}\right)$$

$$= \ln\left(\frac{1}{9}\right)^{-1/2}$$

$$= \ln 9^{1/2} \quad = \underline{\ln 3}$$