

#5 (a)

Evaluate

$$\begin{aligned} & \frac{\log_2 24 - \frac{1}{2} \log_2 72}{\log_3 18 - \frac{1}{3} \log_3 72} = \frac{\log_2 24 - \log_2 72^{\frac{1}{2}}}{\log_3 18 - \log_3 72^{\frac{1}{3}}} = \\ & = \frac{\log_2 \left( \frac{24}{\sqrt{72}} \right)}{\log_3 \left( \frac{18}{\sqrt[3]{72}} \right)} = \frac{\log_2 \left( \frac{24}{\sqrt{36} \sqrt{2}} \right)}{\log_3 \left( \frac{18}{\sqrt[3]{8} \sqrt[3]{9}} \right)} = \frac{\log_2 \left( \frac{24}{6\sqrt{2}} \right)}{\log_3 \left( \frac{18}{2\sqrt[3]{9}} \right)} = \frac{\log_2 \left( \frac{4}{\sqrt{2}} \right)}{\log_3 \left( \frac{9}{\sqrt[3]{9}} \right)} \\ & = \frac{\log_2 4 - \log_2 \sqrt{2}}{\log_3 9 - \log_3 \sqrt[3]{9}} = \frac{2 - \frac{1}{2}}{2 - \log_3 9^{\frac{1}{3}}} = \frac{\frac{3}{2}}{2 - \frac{1}{3} \log_3 9} = \\ & = \frac{\frac{3}{2}}{2 - \frac{1}{3}(2)} = \frac{\frac{3}{2}}{2 - \frac{2}{3}} = \left( \frac{3}{2} \right) \div \left( \frac{4}{3} \right) = \left( \frac{3}{2} \right) \left( \frac{3}{4} \right) = \frac{9}{8} \end{aligned}$$