40. Popular properties of logarithms.

1. $a^{\log_a M} = M$
2. $\log_a a^r = r$
3. $\log_a M^r = r\log_a M$
4. $\log_a (MN) = \log_a M + \log_a N$
5. $\log_a \left(\frac{M}{N}\right) = \log_a M - \log_a N$
6. $\log_a \left(\frac{1}{N}\right) = -\log_a N$
7. $\log_a a = 1$
8. $\log_a 1 = 0$
9. $\log_a 0 = \mathit{undefined}$

All three in the question are properties of logarithms.
Answer: E

41. If f(x) = 5 – 2x^3 and f^1 denotes the inverse function of f, then f^1(x) =

An inverse function is basically the reverse of the regular function. For example if you plug in 2 for x you get -11. If you plug -11 into the inverse function you will your original 2 back. So we need to figure which of the answers satisfies this condition. So we plug -11 for x into the equations and see which one gives us a result of 2.

A) $\sqrt[3]{\frac{5-x}{2}}, \sqrt[3]{\frac{5-(-11)}{2}} = \sqrt[3]{\frac{16}{2}} = \sqrt[3]{8} = 2$

Well in this case if was the first one. You can also find the inverse function by switching the f(x) and x terms in the original problem and solving for f(x). Check this out.

f(x) = 5 – 2x^3 , original
x = 5 – 2(f(x))^3 , inverse function, now isolate f(x)
x-5 = -2(f(x))^3 , subtract 5 from both sides
$\frac{x-5}{-2} = (f(x))^3$, divide by -2
$-\frac{x-5}{2} = (f(x))^3$, rewrite with negative sign in front
$\frac{-x+5}{2} = (f(x))^3$, distribute the negative sign
$\frac{5-x}{2} = (f(x))^3$, rearrange the numerator

$\sqrt[3]{\frac{5-x}{2}} = \sqrt[3]{(f(x))^3}$, take the 3 root of each side

$\sqrt[3]{\frac{5-x}{2}} = f(x)$, final answer

Answer: A

42. $\frac{2x-1}{x+3} - \frac{x-2}{2x+1} =$

This is the subtraction of two fractions. When you add or subtract fractions they first need to have common denominators. The easiest way to get a common denominator is the multiply the original denominators together.

(x+3)(2x+1) This will be the new denominator. Remember you have to multiply the top by the other denominator to keep the fractions the same.

$\frac{(2x+1)(2x-1)}{(x+3)(2x+1)} - \frac{(x+3)(x-2)}{(x+3)(2x+1)}$

Now multiply out the numerators (FOIL)

$\frac{4x^2-1}{(x+3)(2x+1)} - \frac{x^2+x-6}{(x+3)(2x+1)}$ Multiply the numerators out, FOIL

$\frac{4x^2-1}{(x+3)(2x+1)} + \frac{-x^2-x+6}{(x+3)(2x+1)}$ Distribute the negative to the second fraction

$\frac{4x^2-1-x^2-x+6}{(x+3)(2x+1)}$ Combine the fractions into one fraction

$\frac{3x^2-x+5}{(x+3)(2x+1)}$ Combine like terms

Answer: D