

Day 1 Simplify

$$1. \frac{-12x^{3/4}y^2}{8x^{3/2}y^{-4/3}} = \frac{-3y^{10/3}}{2x^{3/4}}$$

$$2. \left(81x^2y^{3/2}\right)^{1/4} \cdot 27^{1/2}x^{2/5}y^3$$

$$\left(3^4\right)^{1/4} \left(x^2\right)^{1/4} \left(y^{3/2}\right)^{1/4} \cdot \left(3^3\right)^{1/2} x^{2/5} y^3$$

$$\underline{3} x^{1/2} y^{3/8} \cdot \underline{3}^{3/2} x^{2/5} y^3$$

$$3^{5/2} x^{10/10} y^{27/8} x^{2/5} y^3$$

Day 2:Given $f(x) = 3x^2 - 2x + 5$ and $g(x) = 2x + 1$. Find...a. $(g - f)(x)$

$$(2x+1) - (3x^2 - 2x + 5)$$

$$2x+1 - 3x^2 + 2x - 5$$

$$\boxed{-3x^2 + 4x - 4}$$

b. $(gf)(x)$

$$(2x+1)(3x^2 - 2x + 5)$$

$$\boxed{6x^3 - x^2 + 8x + 5}$$

$$\left(\frac{f}{g}\right)x$$

$$\frac{3x^2 - 2x + 5}{2x + 1}$$

c.

 $(f \circ g)(x)$

$$f(g(x))$$

$$f(2x+1)$$

$$= 3(2x+1)^2 - 2(2x+1) + 5$$

$$3(2x+1)(2x+1)$$

$$3(4x^2 + 4x + 1)$$

$$12x^2 + 12x + 3 - 4x - 2 + 5$$

$$\boxed{12x^2 + 8x + 6}$$

Day 3:

Find the inverse of the following functions:

a) $f(x) = \frac{3}{2}x - 18$

$$y = \frac{3}{2}x - 18$$

$$x = \frac{3}{2}y - 18$$

$$\frac{2}{3}(x+18) = \frac{2}{3}\left(\frac{3}{2}y\right)$$

$$y = \frac{2}{3}(x+18) = f^{-1}(x)$$

b) $y = (2x + 8)^3 + 7$, (factor out LC)

$$x = (2y + 8)^3 + 7$$

$$(x-7)^{\frac{1}{3}} = (2y+8)^{\frac{1}{3}}$$

$$(x-7)^{\frac{1}{3}} = 2y+8$$

$$\frac{1}{2}((x-7)^{\frac{1}{3}} - 8) = 2y$$

$$y^{-1} = \frac{1}{2}((x-7)^{\frac{1}{3}} - 8)$$
$$y = \frac{1}{2}(x-7)^{\frac{1}{3}} - 4$$

Day 4:

Find the inverse of the following function:

$$f(x) = -2\sqrt{x+5} - 8; \text{ include domain restriction}$$

$$y = -2\sqrt{x+5} - 8$$

$$x = -2\sqrt{y+5} - 8$$

$$\frac{1}{2}(x+8) = -\sqrt{y+5}$$

$$\left(-\frac{1}{2}(x+8)\right)^2 = \left(\sqrt{y+5}\right)^2$$

$$\left(-\frac{1}{2}(x+8)\right)^2 = y+5$$

$$\left(-\frac{1}{2}(x+8)\right)^2 - 5 = f^{-1}(x)$$

Day 5: Verify the following are inverses:

$$f(x) = \frac{1}{2}x^4 - 2 \quad g(x) = \sqrt[4]{2x+4}$$

$$f(g(x)) = f(\sqrt[4]{2x+4})$$

$$= \frac{1}{2}(\sqrt[4]{2x+4})^4 - 2$$

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

$$x + 2 - 2$$

X

$$g(f(x)) = g\left(\frac{1}{2}x^4 - 2\right)$$

$$= \sqrt[4]{2\left(\frac{1}{2}x^4 - 2\right) + 4}$$

$$\sqrt[4]{x^4 - 4 + 4}$$

$$\sqrt[4]{x^4} = x$$