

1) Prove the identity: $(x-y)^3 = x^3 - 3x^2y + 3xy^2 - y^3$

$$\begin{aligned} (x-y)(x-y)(x-y) &= x^3 - 3x^2y + 3xy^2 - y^3 \\ (x^2 - 2xy + y^2)(x-y) &= x^3 - 3x^2y + 3xy^2 - y^3 \\ x^3 - \cancel{x^2y} - 2\cancel{x^2y} + \cancel{2xy^2} + \cancel{xy^2} - y^3 &= x^3 - 3x^2y + 3xy^2 - y^3 \\ x^3 - 3x^2y + 3xy^2 - y^3 &= x^3 - 3x^2y + 3xy^2 - y^3 \end{aligned}$$

2) Factor completely.

A) $8x^3 - 27$

$$(2x-3)(4x^2+6x+9)$$

C) $x^3 + 216$

$$(x+6)(x^2-6x+36)$$

B) $169x^2 - 16y^2$

$$(13x+4y)(13x-4y)$$

D) $x^4 + 64x$

$$x(x^3 + 64)$$

$$x(x+4)(x^2-4x+16)$$

3) Find the inverse of $g(x) = \frac{x-9}{x+1}$ and state the domain of $g(x)$

$$y = \frac{x-9}{x+1}$$

$$D: x \neq -1$$

$$(y+1)(x) = \left(\frac{y-9}{y+1}\right)^{y+1}$$

$$xy + x = y - 9$$

$$xy - y = -x - 9$$

$$\frac{y(x-1)}{x-1} = \frac{-x-9}{x-1}$$

$$y = \frac{-x-9}{x-1}$$

$$g^{-1}(x) = \frac{-x-9}{x-1}$$

- 4) Create the equation, in standard form, of a cubic whose x-intercepts are given by the set $\{3, -5, 2\}$ and which passes through the point $(4, -54)$.

F.F.

$$y = a(x-3)(x+5)(x-2)$$

$$-54 = a(4-3)(4+5)(4-2)$$

$$-54 = a(1)(9)(2)$$

$$\frac{-54}{18} = \frac{18a}{18}$$

$$a = -3$$

S.F.

$$y = -3(x-3)(x+5)(x-2)$$

$$y = (-3x+9)(x^2+3x-10)$$

$$y = -3x^3 - 9x^2 + 30x + 9x^2 + 27x - 90$$

$$y = -3x^3 + 57x - 90$$

Factored Form: $y = -3(x-3)(x+5)(x-2)$

Standard Form: $y = -3x^3 + 57x - 90$

Sketch the graph indicating the window which shows all turning points, x-intercepts, and y-intercept.

