Station 1: Factoring

Factor each completely.

1) $15xy + 40x^2 + 12y + 32x$

$(5x + 4)(3y + 8x)$

2) $120xy + 168x - 140y^2 - 196y$

$4(6x - 7y)(5y + 7)$

3) $15xy + 3x^2 + 10y + 2x$

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

4) $x^6 - 1 = 0$

$(x - 1)(x^2 + x + 1)(x + 1)(x^2 - x + 1) = 0$

5) $x^6 - 28x^3 + 27 = 0$

$(x - 3)(x^2 + 3x + 9)(x - 1)(x^2 + x + 1) = 0$

6) $x^6 + 63x^3 - 64 = 0$

$(x - 1)(x^2 + x + 1)(x + 4)(x^2 - 4x + 16) = 0$

7) $1 + 216m^3$

$(1 + 6m)(1 - 6m + 36m^2)$

8) $375x^3 + 24$

$3(5x + 2)(25x^2 - 10x + 4)$

9) $500 - 256m^3$

$4(5 - 4m)(25 + 20m + 16m^2)$

10) $x^3 - 27$

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

Station 2: Synthetic Division/Rational Root Theorem

State the possible rational zeros for each function. Then find all rational zeros.

1) $f(x) = 2x^3 - 14x^2 + 31x - 55$

Possible rational zeros:

$\pm 1, \pm 5, \pm 11, \pm 55, \pm \frac{1}{2}, \pm \frac{5}{2}, \pm \frac{11}{2}, \pm \frac{55}{2}$

Rational zeros: $\{5\}$

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

Possible rational zeros: $\pm 1, \pm \frac{1}{2}$

Rational zeros: $\left\{\frac{1}{2}, 1, -1\right\}$

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

Possible rational zeros: $\pm 1, \pm \frac{1}{5}$

Rational zeros: $\left\{1, -\frac{1}{5}, -1\right\}$

Divide.

4) $(b^3 - 5b^2 - 25b + 11) \div (b - 8)$

$b^2 + 3b - 1 + \frac{3}{b - 8}$

5) $(4a^3 + 12a^2 + 18a + 17) \div (a + 1)$

$4a^2 + 8a + 10 + \frac{7}{a + 1}$

Station 3: Optimization

1) A farmer has 2400 ft of fencing and wants to fence off a rectangular field that borders a straight river. He needs no fence along the river. What are the dimensions of the field that has the largest area?

2) We need to enclose a field with a rectangular fence. We have 500 ft of fencing material and a building is on one side of the field and so won't need any fencing. Determine the dimensions of the field that will enclose the largest area.

3) We have a piece of cardboard that is 14 in by 10 in and we're going to cut out the corners as shown below and fold up the sides to form a box, also shown below. Determine the height of the box that will give a maximum volume.

Station 4: Applications of Polynomials

1. A storage company needs to design a new storage box that has twice the volume of its largest box. Its largest box is 5 ft long, 4 ft wide, and 3 ft high. The new box must be formed by increasing each dimension by the same amount. Find the increase in each dimension.

2. A block of cheese is in the shape of a rectangle prism and is square on each end. The length is 4 times the width of each square end. A 2-inch slice is cut from one end of the cheese and the remaining piece of cheese has a volume of 222 cubic inches.

Station 5: Properties of Exponents

Simplify. Your answer should contain only positive exponents.

1) $x^0y^{-1} \cdot (-x^3y^{-1})^{-5}$ $-\frac{y^4}{x^{15}}$

2) $((-u^5v^3)^5 \cdot u^{-4})^4$ $u^{84}v^{60}$

3) $x^3y^2 \cdot (-x^{-3}y^{-2})^2$ $\frac{1}{x^3y^2}$

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

4) $\frac{u^{-2}v^{-\frac{1}{4}} \cdot u^{-\frac{1}{3}}v^0 \cdot u^0v^{\frac{3}{4}}}{(u^0)^{-1}}$ $\frac{v^{\frac{1}{2}}u^{\frac{2}{3}}}{u^3}$

5) $\left(\frac{y}{x^{\frac{5}{3}}y^{-\frac{1}{2}} \cdot yx^4}\right)^0$ 1

Station 6: Properties of Logarithms

Expand each logarithm.

1) $\log_3 (w^5\sqrt{u})$

$5\log_3 w + \frac{\log_3 u}{2}$

2) $\log_4 (x \cdot y \cdot z^4)$

$\log_4 x + \log_4 y + 4\log_4 z$

3) $\log_2 (x^3y^5)$

$3\log_2 x + 5\log_2 y$

Condense each expression to a single logarithm.

4) $\frac{\log_4 x}{2} + \frac{\log_4 y}{2} + \frac{\log_4 z}{2}$

$\log_4 \sqrt{zyx}$

5) $4\log_3 u + 3\log_3 v$

$\log_3 (v^3u^4)$

6) $2\log_4 u - 10\log_4 v$

$\log_4 \frac{u^2}{v^{10}}$

Station 7: Solving Exponential and Logarithmic Equations

Solve each equation. Round your answers to the nearest ten-thousandth.

1) $2 \cdot 10^{9x} + 10 = 13$

0.0196

2) $9 \cdot 10^{m+6} + 6 = 57$

-5.2467

3) $10 \cdot 10^{5p} - 2 = 15$

0.0461

Solve each equation.

4) $\log x + \log (x + 15) = 2$

$\{5\}$

5) $\log (x + 4) + \log 7 = \log 23$ $\left\{-\frac{5}{7}\right\}$

6) $\log x - \log (x - 3) = 1$ $\left\{\frac{10}{3}\right\}$

Station 8: Solving with U-Substitution

Solve the equations:

1) $x^{\frac{2}{3}} + x^{\frac{1}{3}} - 2 = 0$

x = -8 or x = 1

2) $(x-2)^2 - 5(x-2) - 6 = 0$

X = 1 or x = 8

3) $3^{2x} - 5(3^x) + 4 = 0$

x= 0 or x= 1.26

Station 9: Applications of Exponentials and Logarithms

1) Your 3 year investment of $20,000 received 5.2% interested compounded semi annually. What is your total return?
   $ 23, 329.97

2) Your 6.25 year investment of $40,000 at 14% compounded quarterly is worth how much now?
   $94,629.80

3) If you invest $20,000 at an annual interest rate of 1% compounded continuously, calculate the final amount you will have in the account after 20 years.
   $24,428.05

Station 10: Graphing

1. Sketch: $y = 2^{x-7} + 5$ a. Domain: (-infinity, infinity) b. Range: (5, infinity) c. Asymptotes: y = 5 d. End Behavior: x→ infinity, y→ infinity x→ -infinity, y→ 5 e. Y-intercept: (0, 5.008) f. X-intercept: none	2. Sketch: $y = \log(x+2) - 1$ a. Domain: (-2, infinity) b. Range: (-infinity, infinity) c. Asymptotes: x = -2 d. End Behavior: x→-2, y→ - infinity x→ infinity , y→ infinity e. Y-intercept: (0, -.69897) f. X-intercept: (8, 0)