Show all work for problems 4–8; use the back of the sheet if necessary.

1. **(1 points)** *Express the interval* $(-2, 5]$ *in terms of inequalities.*

   The parenthesis indicates a non-inclusive inequality; the square bracket indicates an inclusive inequality, so this interval can be ddescribed as $-2 < x \leq 5$.

2. **(1 points)** *Express the inequality* $x \geq 6$ *in interval notation.*

   Since this interval includes 6 as its bottom bound, we would use a square bracket on the left boundary. Since there is no bound on the right, we use the peculiar infinite-boundary notation to give interval $[6, \infty)$ or $[6, +\infty)$.

3. **(2 points)** *Evaluate the expression* $(-8)^{4/3}$.

   This can be decomposed as $[(-8)^{1/3}]^4 = \sqrt[3]{-8}^4$, or as $[(-8)^4]^{1/3} = \sqrt[3]{(-8)^4}$. Both will give you the same answer, but the former is much easier to evaluate:

$$\sqrt[3]{-8}^4 = (-2)^4 = 16$$

$$\sqrt[3]{(-8)^4} = \sqrt[3]{4096} = 16$$

4. **(3 points)** *Expand the polynomial* $2x^3 - (x^2 - 4x)(x + 3)$.

$$\begin{aligned} 2x^3 - (x^2 - 4x)(x + 3) &= 2x^3 - (x^3 + 3x^2 - 4x^2 - 12x) \\ &= 2x^3 - x^3 - 3x^2 + 4x^2 + 12x) \\ &= x^3 + x^2 + 12x \end{aligned}$$

5. **(3 points)** *Simplify the rational expression* $\frac{\frac{x+1}{x^2}}{\frac{2x}{x-1}}$.

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

6. **(3 points)** *Using any method you like, solve the equation* $x^2 + 3x - 4 = 0$.

   You could factor the left side by trial and error, finding that $(x - 1)(x + 4) = 0$. Then, using the fact that a product equals zero only if one of its factors equals zero, you may note that $x - 1 = 0$ or $x + 4 = 0$, and thus $x = 1$ or $x = -4$.

   Alternatively, you can complete the square (a method not learned in class, but which some of you may have encountered), to build the square $x^2 + 3x + \frac{9}{4} - \frac{9}{4} - 4 = 0$, so $x^2 + 3x + \frac{9}{4} = \frac{25}{4}$. This gives $(x + \frac{3}{2})^2 = \frac{25}{4}$, so $x + \frac{3}{2} = \pm\sqrt{\frac{25}{4}} = \pm\frac{5}{2}$. Then $x = \pm\frac{5}{2} - \frac{3}{2}$, which takes on values $x = -4$ and $x = 1$.

   Another alternative is to use the quadratic formula $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$ to get

$$x = \frac{-3 \pm \sqrt{3^2 - 4 \cdot 1 \cdot (-4)}}{2 \cdot 1} = \frac{-3 \pm \sqrt{25}}{2} = \frac{-3 \pm 5}{2} = -4 \text{ or } 1$$

7. **(4 points)** *A job pays \$8 per hour for the standard 40 hours worked per week; for time beyond that 40 hours, it pays \$12 per hour. If you earn \$380 at this job in a particular week, how many hours of overtime did you work?*

   Let x represent the number of hours of overtime worked. The amount you earned is the sum of your payment for 40 hours at the standard rate and x hours at the higher rate: you are thus paid $40 \cdot 8 + x \cdot 12$ dollars. Since you earned \$380 in total, this question asserts that $40 \cdot 8 + x \cdot 12 = 380$. Solving this equation:

$$\begin{aligned} 40 \cdot 8 + x \cdot 12 &= 380 \\ 320 + 12x &= 380 \\ 12x &= 60 \\ x &= 5 \end{aligned}$$

   so this pay results from working five hours of overtime.

8. **(3 points)** *Find an equation, in any of the standard line-equation forms you like, for the line passing through the point $(-1, 3)$ which is parallel to the line $y = -2x + 4$.*

   $y = -2x + 4$ has slope -2 by inspection; any line parallel to it will also have slope -2. We want such a line through the point $(-1, 3)$. The easiest way to get an equation for such a line is to invoke the point-slope form

$$(y - y_0) = m(x - x_0)$$

   with slope $m = -2$, known x-coordinate $x_0 = -1$, and known y-coordinate $y_0 = 3$ to get

$$y - 3 = -2(x + 1)$$

   If you prefer slope-intercept form, this expression is easily manipulated to give $y = -2x + 1$.

It seems like people who could divide fractions easily would have little trouble with their life after that, too. —*Only Yesterday*, Isao Takahata