

Problems out of order: 10 points off; Writing too faint: 10 points off; No margin in top left corner: 10 points off.

1. Solve the equation  $x^2 + 3x - 28 = 0$  in three different ways:
  - a. (10 pts) Factoring
  - b. (10 pts) Completing the Square
  - c. (10 pts) Quadratic Formula
2. Solve the absolute value inequalities. Give your answers in set-builder *and* interval notation.
  - a. (10 pts)  $|-5x - 8| > 4$
  - b. (10 pts)  $|-5x - 8| \leq 4$
3. Let  $f(x) = \sqrt{x+16}$  and  $g(x) = x^2 - 4x - 21$ .
  - a. (10 pts) What is the domain of  $f$ ? Give your answer in set-builder and interval notation.
  - b. (10 pts) What is the domain of  $g$ ? Give your answer in set-builder and interval notation.
  - c. (5 pts) Determine  $\left(\frac{f}{g}\right)(x)$  (Just  $\frac{f}{g}$ , for short). Do *not* simplify your answer.

- B 1** (5 pts) What is the domain of  $\frac{f}{g}$ ?
- d. (10 pts) Determine  $(f \circ g)(x)$  (Just  $f \circ g$ , for short). *Simplify* your answer.
  - e. (5. pts) What is the domain of  $f \circ g$ ?

4. (10 pts) Solve  $(x+3)^{1/3}(x-1)^4(x-5) \leq 0$ . Give your answer in interval notation.
5. (10 pts) What is the domain of  $f(x) = \sqrt{(x+3)^{1/3}(x-1)^4(x-5)}$ ?

- B 2** (5 pts) What is the domain of  $g(x) = \log_{1/2}((x+3)^{1/3}(x-1)^4(x-5))$ ?

6. (10 pts) What is the domain of  $g(x) = \sqrt{\frac{(x+3)^{1/3}(x-1)^4}{(x-5)}}$ ?

7. (10 pts) Use synthetic division to find  $P(2)$ , for  $P(x) = 2x^5 - 5x^4 - 2x^2 + 6x - 13$

8. (10 pts) Determine  $a$ ,  $r$ , and  $n$  for the finite geometric sequence  $\frac{5}{2}, 5, 10, \dots, 640$ . Use  $a$ ,  $r$ , and  $n$  to

determine the *exact* value of the sum  $\sum_{k=1}^n a \cdot r^{k-1} = a \left( \frac{1-r^n}{1-r} \right)$ . For full credit, a fraction in lowest terms is required.

9. (10 pts) Find the sum of the infinite geometric series  $\sum_{k=1}^{\infty} 2 \cdot \left(\frac{3}{7}\right)^{k-1}$

Finance Formulas:

$$A = P \left(1 + \frac{r}{m}\right)^{mt} = P(1+i)^n \quad FV = R \left( \frac{\left(1 + \frac{r}{m}\right)^{mt} - 1}{\left(\frac{r}{m}\right)} \right) = R \left( \frac{(1+i)^n - 1}{i} \right)$$

10. (10 pts) What is the future value, in 10 years, of \$5,000 deposited at 5% annual percentage rate, compounded weekly? (Recall, there are 52 weeks in a year.)
11. Answer ONE of the following:
- (10 pts) If your monthly loan payments are \$958.00, and the loan is for 15 years, how much did you borrow in the first place, if you're paying 4.5% annual percentage rate, compounded monthly?
  - (10 pts) How long – to the nearest year – will it take for 100 grams of Niobium-94 to decay to 13 grams, if its half-life is 20,300 years?
12. Let  $g(x) = -2 \cdot \sqrt{-5x+40} + 7$ .
- (20 pts) Start with the graph of  $f(x) = \sqrt{x}$ , and proceed to the graph of  $g(x)$  with 4 more graphs, demonstrating each of the 4 basic transformations. So, 5 graphs, in all, counting the graph of  $f(x)$  as the first. Label the 3 points,  $(0,0)$ ,  $(1,1)$ , and  $(4,2)$  in the graph of  $f(x)$ , and track where they end up after each transformation. Each transformation leaves one coordinate fixed and changes one in a very particular way. Your job is to understand which coordinate, and how it's affected by the transformation.
  - (5 pts) Find the  $x$ -intercept of the graph of  $g(x)$ , above. Report it as an ordered pair,  $A$ , in your answer, and label it as  $A$  on the final graph from part a. For full credit, use fractions in lowest terms for the coordinates.
  - (5 pts) Find the  $y$ -intercept of the graph of  $g(x)$ , above. Report it as an ordered pair,  $B$ , in your answer, and label it as  $B$  on the final graph from part a. For full credit, use a radical expression, in lowest terms.

**Bonus** Answer up to 20 points' worth.

**B 3** (5 pts) Let  $f(x) = -\ln(5x+4) - 9$ . Find  $f^{-1}(x)$ .

**B 4** (5 pts) Use the Binomial Theorem (Pascal's Triangle!) to expand  $(2x-3y)^5$ .

$$x + y + z = 4$$

**B 5** (10 pts) Solve the system of linear equations:  $y - z = 4$

$$-3x + 2y - 7z = 7$$

- B 6** (5 pts) John can finish a job in 10 hours that it takes Bill only 7 hours to finish. Suppose Bill shows up and starts working 3 hours before John shows up, and then they work together until the job is done. How many hours does each of the two end up working? For full credit, I expect a fraction, in lowest terms for each person's time.

$$3x + 5y \leq 30$$

$$5x - 2y \leq 10$$

**B 7** (5 pts) Sketch the following system of inequalities:  $x \geq 0$

$$y \geq 0$$