Test 7   Name _____

Calculators are not allowed on this portion of the test. Answer each question in the space provided. Show all work for full credit.

1. Given $P(x) = 4(x + 9)^2(x - 2)(x - 5)^3$:
   2 A. What is the degree of the polynomial? __6__

   1 B. What is the leading coefficient? __4__

   2 C. What is the end behavior? __↑↑__

   6 D. What are the x-intercepts and how does the graph behave at each of the intercepts?

   $(-9, 0)$ $(2, 0)$ $(5, 0)$
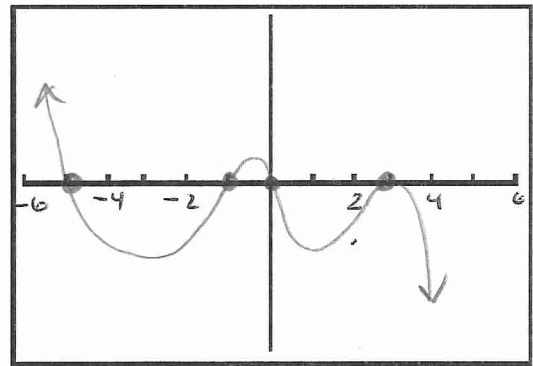   Bounce   Through   Wiggle

2. Given $y = -3x(x + 5)(x + 1)(x - 3)^2$:
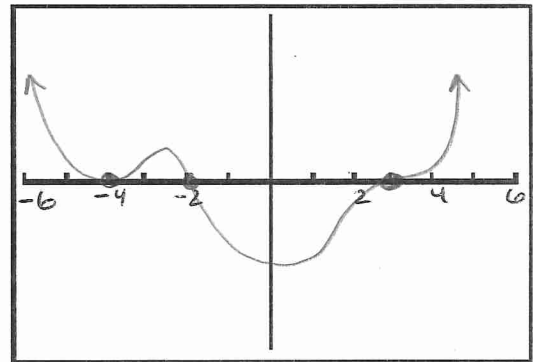   2 A. What is the degree of the polynomial? __5__

   1 B. What is the leading coefficient? __−3__

   2 C. What is the end behavior? __↑↓__
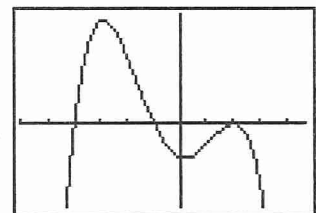
   4 D. Sketch the graph.

3. Draw a sketch of $g(x) = (x + 4)^2(x + 2)(x - 3)^3$.
   4

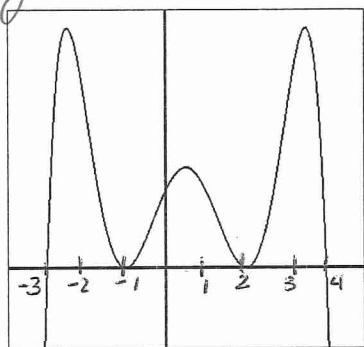4. Given the graph shown, answer the following questions. The scale is 1 unit.

   2 A. Is the degree of the equation even or odd? __even__

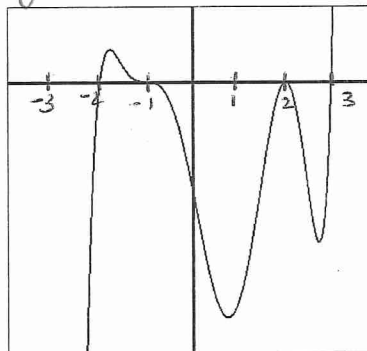   2 B. Is the leading coefficient positive or negative? __negative__

5. Write the equations of the graph shown below.

4 A. $y = -(x+3)(x+1)^2(x-2)^2(x-4)$ B. $y = (x+2)(x+1)^3(x-2)^2(x-3)$ 4

6. Given $f(x) = \dfrac{5x+10}{x^2+2x}$, find: $\dfrac{5(x+2)}{x(x+2)}$

2 A. The horizontal asymptote (if any). $y = 0$

2 B. The vertical asymptote(s), if any. $x = 0$

1 C. Holes, if any. $x = -2$

7. Given $f(x) = \dfrac{2x^2+5x+1}{x+1}$, find:

2 A. Find the vertical asymptote. $x = -1$

3 B. Find the slant asymptote. $y = 2x+3$

$$\begin{array}{r|rrr} -1 & 2 & 5 & 1 \\ & & -2 & -3 \\ \hline & 2 & 3 & 1 \end{array}$$

4 8. Solve $(x+6)(x-2)^2(x-3) > 0$ symbolically. Show the sign chart (or rough sketch) you used.

$(-\infty, -6) \quad (3, \infty)$

$$\underset{-6}{+} \quad \underset{2}{-} \quad \underset{3}{-} \quad +$$

9. Perform the indicated operation and simplify.

3 A) $\dfrac{x^2 - 2x - 35}{x^2 - 49}$ $\qquad \dfrac{(x-7)(x+5)}{(x-7)(x+7)} = \dfrac{x+5}{x+7}$

4 B) $\dfrac{4x^2 - 2x}{x^2 - 16} \div \dfrac{10x - 5}{6x + 24}$ $\qquad \dfrac{2x(2x-1)}{(x+4)(x-4)} \cdot \dfrac{6(x+4)}{5(2x-1)} = \dfrac{12x}{5(x-4)}$

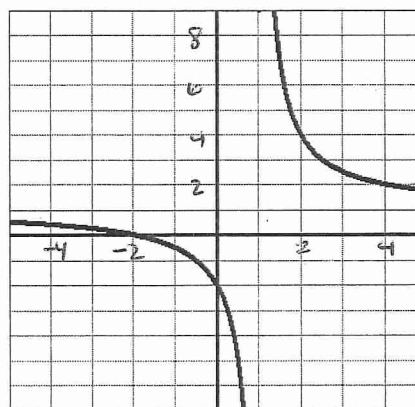**3** C) $\dfrac{5x+3}{x+7} - \dfrac{x-12}{x+7}$ $\qquad \dfrac{4x+15}{x+7}$

4 D) $\dfrac{7}{y^2 - 4y + 3} + \dfrac{3}{y^2 - 1}$

$\dfrac{7\,(y+1)}{(y-3)(y-1)(y+1)} + \dfrac{3\,(y-3)}{(y+1)(y-1)\,(y-3)}$

$\dfrac{10y - 2}{(y-3)(y+1)(y-1)}$

2 10. Use the graph shown to solve the inequality.

$f(x) < 0$ Solution: $(-2, 1)$

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Test 7   Name _____
Calculator Part: You may use your calculator on this part of the test. Be sure to show all necessary work for full credit.

4 1. Solve for x: $\dfrac{7}{x+6} = \dfrac{9}{x-3}$

$$7x - 21 = 9x + 54$$
$$-2x = 75$$
$$x = \dfrac{-75}{2}$$

4 2. Solve $|2x + 1| \le 7$. Show work or explain how you solved.

$$-7 \le 2x + 1 \le 7$$
$$-8 \le 2x \le 6 \qquad [-4, 3]$$
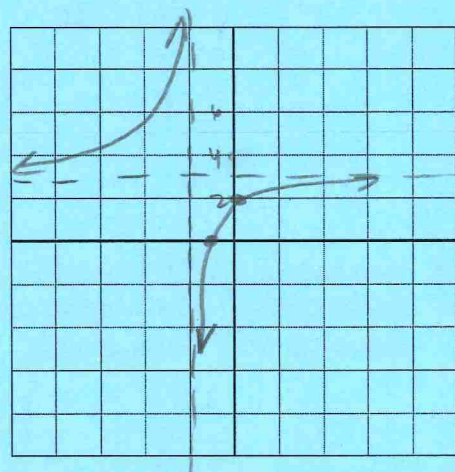$$-4 \le x \le 3$$

3. Given $f(x) = \dfrac{3x+2}{x+1}$, find:

2 A. Horizontal asymptote (if any): __$y = 3$__

2 B. Vertical asymptote(s), if any: __$x = -1$__

2 C. The y-intercept. __$(0, 2)$__

2 D. The x-intercept. __$(-2/3, 0)$__

3 E. Sketch the graph.

4. Don and Julie are going to paint the picket fence that surrounds their house today. Don can paint the fence alone in 12 hours. Julie can paint the fence alone in 9 hours. How long will it take them to paint the fence together?

$$\dfrac{1}{12} + \dfrac{1}{9} = \dfrac{1}{T}$$

$$\dfrac{7}{36} = \dfrac{1}{T}$$

$$T = \dfrac{36}{7} = 5\tfrac{1}{7} \text{ hrs.}$$
$$= 5.14 \text{ hrs.}$$

23

4

5. A fully loaded train travels 16 km/hr slower than an empty train. The loaded train travels 440 km in the same time it takes the empty train to travel 600 km. Find the two speeds.

$$\frac{440}{S-16} = \frac{600}{S}$$

$$440S = 600(S-16)$$

$$440S = 600S - 9600$$
$$-160S = -9600$$
$$S = 60 \text{ km/hr} \cdot \text{empty}$$

$$44 \text{ km/hr full}$$

6. The math club decides to sell t-shirts as a fundraiser. The club spends an initial $80 on designing the shirts and setting up the printing process. In addition, each shirt costs $ 6 for the labor and materials.

   A. Write an equation for the average cost per t-shirt as a function of the number of shirts that are made.

3

$$C = \frac{80 + 6n}{n}$$

   B. What is the horizontal asymptote? Interpret the meaning of the horizontal asymptote in context.

3

$$y = 6$$ the average cost approaches $6/shirt as they make more shirts.

7. You bought a small bag of M&Ms with 17 blue out of 70 M&Ms. If you bought a bag with 520 M&M's in it, how many should be blue? **Write a proportion** that models the situation and solve it to find the answer.

4

$$\frac{17}{70} = \frac{x}{520}$$

$$70x = 17(520)$$
$$70x = 8840$$
$$x = 126 \text{ blue}$$

14

Test 7   Name _____

Calculators are not allowed on this portion of the test. Answer each question in the space provided. Show all work for full credit.

1. Given $P(x) = 3(x + 11)^2(x - 2)(x - 9)^3$:
   2 A. What is the degree of the polynomial? ___6___

   1 B. What is the leading coefficient? ___3___

   2 C. What is the end behavior? ___↑↑___

   6 D. What are the x-intercepts and how does the graph behave at each of the intercepts?

   $(-11, 0)$ $(2, 0)$ $(9, 0)$
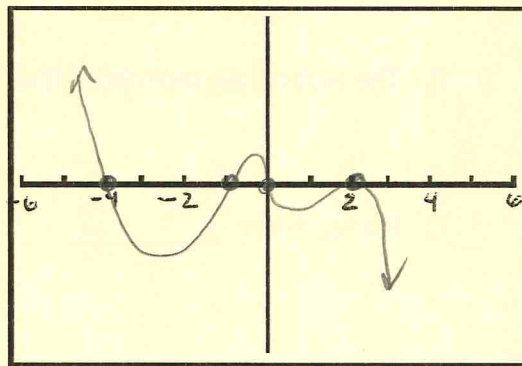   Bounce   through   Wiggle

2. Given $y = -3x(x + 4)(x + 1)(x - 2)^2$:
   2 A. What is the degree of the polynomial? ___5___
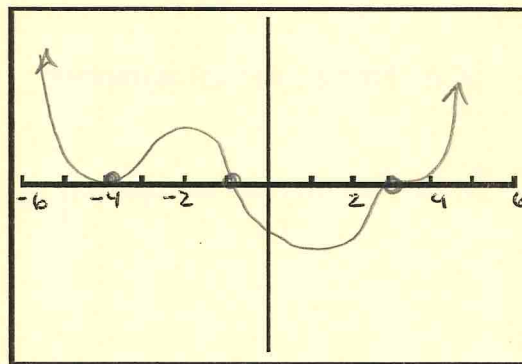
   1 B. What is the leading coefficient? ___-3___

   2 C. What is the end behavior? ___↑↓___

   4 D. Sketch the graph.

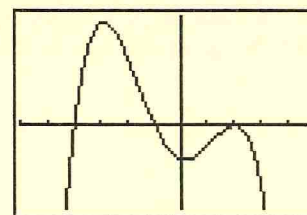3. Draw a sketch of $g(x) = (x + 4)^2(x + 1)(x - 3)^3$.

4

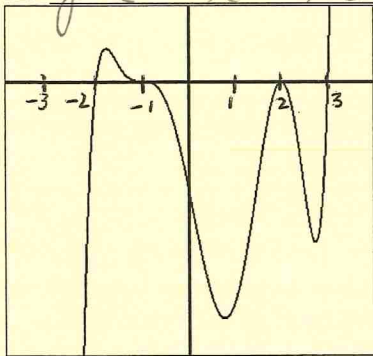4. Given the graph shown, answer the following questions. The scale is 1 unit.

   2 A. Is the degree of the equation even or odd? ___even___

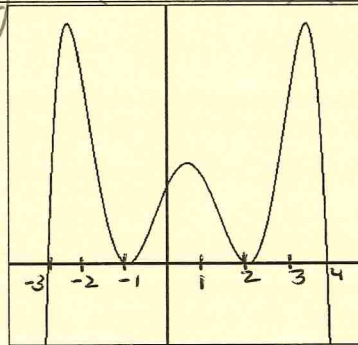   2 B. Is the leading coefficient positive or negative? ___negative___

5. Write the equations of the graph shown below.

4 A. $y = (x+2)(x+1)^3(x-2)^2(x-3)$ 4B. $y = -(x+3)(x+1)^2(x-2)^2(x-4)$

6. Given $f(x) = \dfrac{7x+14}{x^2+2x}$, find: $\dfrac{7(x+2)}{x(x+2)}$

2 A. The horizontal asymptote (if any). $y = 0$

2 B. The vertical asymptote(s), if any. $x = 0$
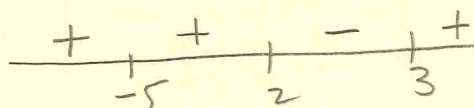
1 C. Holes, if any. $x = -2$

7. Given $f(x) = \dfrac{2x^2+x+3}{x+1}$, find:

2 A. Find the vertical asymptote. $x = -1$

3 B. Find the slant asymptote. $y = 2x - 1$

$$\begin{array}{c|ccc} -1 & 2 & 1 & 3 \\ & & -2 & 1 \\ \hline & 2 & -1 & 4 \end{array}$$

8. Solve $(x+5)^2(x-2)(x-3) > 0$ symbolically. Show the sign chart (or rough sketch) you
4   used.

$(-\infty, -5)\ (-5, 2)\ (3, \infty)$

$$\begin{array}{ccccccc} + & & + & & - & & + \\ \hline & -5 & & 2 & & 3 & \end{array}$$

22

9. Perform the indicated operation and simplify.

3A) $\dfrac{x^2 - 2x - 35}{x^2 - 25}$ $\dfrac{(x-7)\cancel{(x+5)}}{\cancel{(x+5)}(x-5)} = \dfrac{x-7}{x-5}$

4 B) $\dfrac{4x^2 - 2x}{x^2 - 16} \div \dfrac{10x - 5}{6x + 24}$ $\dfrac{2x(2x-1)}{(x+4)(x-4)} \cdot \dfrac{6(x+4)}{5(2x-1)} = \dfrac{12x}{5(x-4)}$
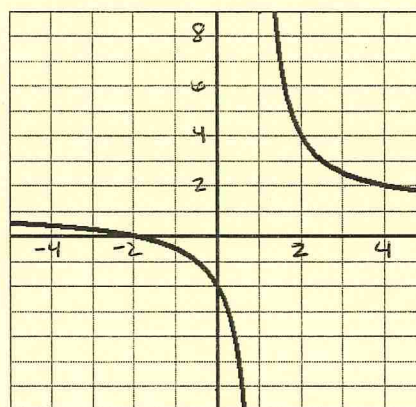
3 C) $\dfrac{6x + 5}{x + 7} - \dfrac{x - 12}{x + 7}$ $= \dfrac{5x + 17}{x+7}$

4 D) $\dfrac{4}{y^2 - 4y + 3} + \dfrac{3}{y^2 - 1}$

$\dfrac{4 \quad (y+1)}{(y-3)(y-1)(y+1)} + \dfrac{3 \quad (y-3)}{(y-1)(y+1)(y-3)} = \dfrac{7y - 5}{(y-3)(y+1)(y-3)}$

2

10. Use the graph shown to solve the inequality.

$f(x) < 0$ Solution: $\underline{(-2, 1)}$

16

Test 7   Name _____

Calculator Part: You may use your calculator on this part of the test. Be sure to show all necessary work for full credit.

4 1. Solve for x: $\dfrac{7}{x-6} = \dfrac{10}{x+3}$

$$7x+21 = 10x-60$$
$$\frac{-3x}{-3} = \frac{-81}{-3} \qquad x = \frac{81}{3} = 27$$

4 2. Solve $|4x+5| \le 7$. Show work or explain how you solved.

$$-7 \le 4x+5 \le 7$$
$$\frac{-12}{4} \le \frac{4x}{4} \le \frac{2}{4} \qquad \left[-3, \tfrac{1}{2}\right]$$
$$-3 \le x \le \tfrac{1}{2}$$
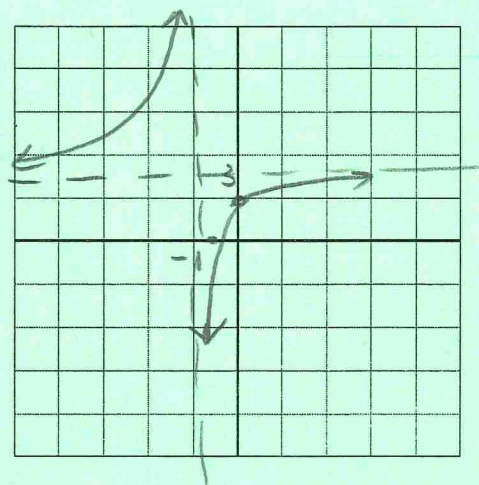
3. Given $f(x) = \dfrac{3x+2}{x+1}$, find:

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2 C. The y-intercept. $(0, 2)$

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4. Steve and Janet are going to paint the picket fence that surrounds their house today. Steve can
4   paint the fence alone in 12 hours. Janet can paint the fence alone in 9 hours. How long will it take them to paint the fence together?

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$$C = \frac{80 + 6n}{n}$$

B. What is the horizontal asymptote? Interpret the meaning of the horizontal asymptote in context.

$$y = 6$$

Average cost approaches $6/shirt.

7. You bought a small bag of M&Ms with 12 blue out of 70 M&Ms. If you bought a bag with 525 M&M's in it, how many should be blue? **Write a proportion** that models the situation and solve it to find the answer.

$$\frac{12}{70} = \frac{x}{525}$$

$$70x = 12(525)$$

$$70x = 6300$$

$$x = 90 \text{ blue}$$