

Chapter 6

Factoring Methods

Factor to find the function's roots.

1) $f(x) = 6x^2 + 11x - 10$

2) $f(x) = 16x^3 + 20x^2 - 6x$

Factor to find all of the zeros.

3) $x^4 - 8x^2 = 9$

4) $x^4 - x^2 - 12 = 0$

Factor to find all of the solutions.

5) $x^3 - 3x^2 + 4x = 12$

6) $4x^3 + 4x^2 - 9x - 9 = 0$

Function Operations

Let $P(x) = 10x^4 - 6x^3 + x$ and
 $Q(x) = 7x^4 + 5x^3 - 3x - 2$ 7) Simplify $P(x) - Q(x)$ 8) Simplify $Q(x) - P(x)$

Polynomial Division

9) Divide $\frac{4x^3 - 3x^2 + 2x - 3}{x - 1}$

10) Given $P(x) = 3x^4 - 11x^3 - 14x - 8$, is
 $(x - 4)$ a factor?

ANSWERS:

- 1) $\frac{2}{3}, -\frac{5}{2}$ 2) $0, \frac{1}{4}, -\frac{3}{2}$
 3) $\pm 3, \pm i$ 4) $\pm 2, \pm i\sqrt{3}$
 5) $3, \pm 2i$ 6) $-1, \pm \frac{3}{2}$
 7) $3x^4 - 11x^3 + 4x + 2$
 8) $-3x^4 + 11x^3 - 4x - 2$
 9) $4x^2 + x + 3$
 10) yes; there is no remainder

11) Is $(2x - 1)$ a factor of $14x^4 - 5x^3 - 11x^2 - 11x + 8$?

12) Divide $\frac{2x^3 - 9x^2 + 15}{2x - 5}$

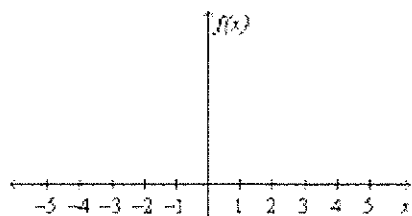
Graph Polynomial Functions from the zeros, end behavior, and multiplicities.

Sketch each graph. First find the zeros and decide whether the function is even/odd and positive/negative.

13) $f(x) = 2(x + 3)(x - 1)(x - 4)$

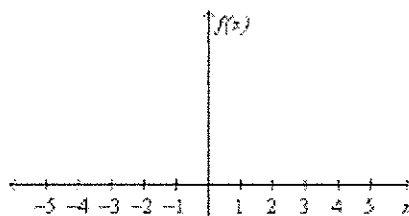
14) $f(x) = -x(x + 4)(x - 2)$

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



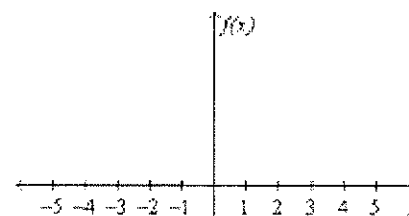
As $x \rightarrow \infty, f(x) \rightarrow$ _____

As $x \rightarrow -\infty, f(x) \rightarrow$ _____



As $x \rightarrow \infty, f(x) \rightarrow$ _____

As $x \rightarrow -\infty, f(x) \rightarrow$ _____



As $x \rightarrow \infty, f(x) \rightarrow$ _____

As $x \rightarrow -\infty, f(x) \rightarrow$ _____

16) A cubic function has zeros at $(-2, 0)$, $(-3, 0)$ and $(4, 0)$. When the function is written in the form $ax^3 + bx^2 + cx + d$, what is the value of b , the coefficient of the quadratic term? *HINT: Write it in factored form first, then multiply it out.*

ANSWERS:

11) Yes (no remainder)

12) $x^2 - 2x - 5 - \frac{10}{2x - 5}$

13-15) check with teacher or calc.

16) std. form: $x^3 + x^2 - 14x - 24$;

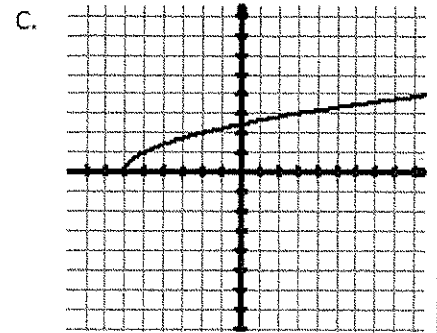
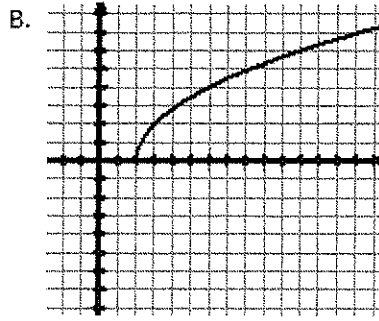
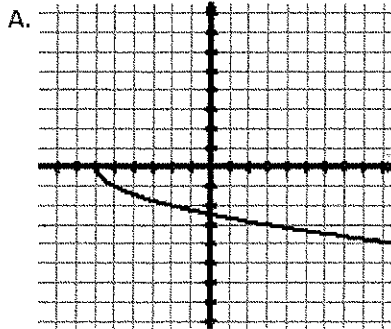
$b = 1$

21) Which graph below matches the function?

$f(x) = \sqrt{x+6}$ _____

$f(x) = -\sqrt{x+6}$ _____

$f(x) = 2\sqrt{x-2}$ _____



Given the cube root parent function $f(x) = \sqrt[3]{x}$, write a new function $g(x)$ for the stated transformation.

22) vertical compression by $\frac{1}{3}$,
shifted four units up

23) reflected over the x -axis,
shifted seven units left

24) translated ten up and four right

Solve. Check for extraneous solutions.

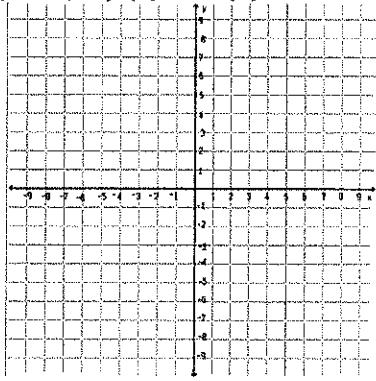
25) $2 = \frac{1}{2}\sqrt{21-x}$ 26) $5 + (x+6)^{\frac{1}{2}} = 10$ 27) $5(x+4)^{\frac{1}{3}} = 15$ 28) $\sqrt{x+7} = x+5$

Chapter 8 - Part 1 (Radicals)

Simplify Radical Expressions			
<p>Rewrite each as a radical expression.</p> <p>1) $x^{\frac{2}{3}}$</p> <p>2) $a^{\frac{2}{5}}b^{\frac{4}{5}}$</p> <p>3) $4b^{\frac{1}{2}}$</p>	<p>Rewrite each as an exponential expression.</p> <p>4) $\sqrt[7]{d^4}$</p> <p>5) $\sqrt[3]{a^2b}$</p> <p>6) $\frac{1}{\sqrt[5]{x^3}}$</p>	<p>Evaluate.</p> <p>7) $36^{\frac{1}{2}}$</p> <p>8) $\sqrt[8]{4^4}$</p> <p>9) $125^{-\frac{1}{3}}$</p>	<p>Simplify completely and write with positive exponents.</p> <p>10) $\frac{6a^4b^8c^0}{8a^3b^{18}}$</p> <p>11) $\frac{5a^{-4}b^0c^2}{15a^5c^{-10}}$</p>
<p>Simplify completely.</p> <p>12) $\sqrt{75a^2b^{16}}$ 13) $2\sqrt{98x^3y^{13}}$ 14) $\sqrt[3]{16a^6b^{27}c^{14}}$</p>		<p>Simplify completely. <i>Break down the radicals first.</i></p> <p>15) $5\sqrt{20} - \sqrt{45}$ 16) $\sqrt{300} + 4\sqrt{75} - \sqrt{12}$</p>	
<p>Simplify completely.</p> <p>17) $(3 + \sqrt{5})(4 - \sqrt{5})$</p> <p>18) $(4 + 2\sqrt{3})(5 - 4\sqrt{3})$</p>		<p>ANSWERS</p> <p>1) $\sqrt[3]{x^2}$ 2) $\sqrt[7]{a^2b^4}$ 3) $4\sqrt{b}$ 4) $d^{\frac{4}{7}}$ 5) $a^{\frac{2}{3}}b^{\frac{1}{3}}$ 6) $x^{-\frac{3}{5}}$ 7) $\sqrt{36} = 6$ 8) $4^{\frac{1}{2}} = 2$ 9) $\frac{1}{\sqrt{125}} = \frac{1}{5}$ 10) $\frac{3a}{4b^{10}}$ 11) $\frac{c^{12}}{3a^5}$ 12) $5ab^8\sqrt{3}$ 13) $14xy^6\sqrt{2xy}$ 14) $2a^2b^9\sqrt{2c}$ 15) $7\sqrt{5}$ 16) $28\sqrt{3}$ 17) $7 - \sqrt{5}$ 18) $-4 - 6\sqrt{3}$ 19) stretched by a factor of 2, shifted 8 units right 20) reflected over the x-axis, shifted four units left</p>	<p>Describe each transformation from the parent function $f(x) = \sqrt{x}$.</p> <p>19) $f(x) = 2\sqrt{x - 8}$</p> <p>20) $f(x) = -\sqrt{x + 4}$</p>

<p>State the transformations from the parent function $f(x) = \frac{1}{x}$ & the asymptote equations for each rational function. Sketch the graph.</p> <p>41) $g(x) = \frac{5}{x-2}$</p>	<p>43) Write the function that is translated 2 up & 7 left from $f(x) = \frac{5}{x}$.</p>	<p>For what values of x is the function undefined?</p> <p>45) $\frac{2x-4}{x+3}$ 46) $\frac{3x+1}{3x(2x-5)}$</p> <p>47) $\frac{x^2-9}{5x^3-4x^2}$</p>
<p>42) $h(x) = \frac{-1}{x+4} - 3$</p>	<p>44) Write a rational function with asymptotes at $x = 3$ and $y = 0$</p>	<p>ANSWERS 41) vertical stretch by a factor of 5, translate 5 down; VA: $x=2$, HA: $y=0$ 42) Reflected, translate left 4, down 3; VA: $x=-4$, $y=-3$ 43) $g(x) = \frac{5}{x+7} + 2$ 44) $g(x) = \frac{1}{x-3}$ 45) $x \neq -3$ 46) $x \neq 0, \frac{5}{2}$ 47) $x \neq 0, \frac{1}{5}$</p>

Chapter 7: Exponential & Logarithmic Functions

<p>Write a function to model the data table.</p> <p>1) <table border="1" style="display: inline-table; margin-right: 20px;"> <thead> <tr><th>Day</th><th>Population</th></tr> </thead> <tbody> <tr><td>0</td><td>1200</td></tr> <tr><td>1</td><td>600</td></tr> <tr><td>2</td><td>300</td></tr> <tr><td>3</td><td>150</td></tr> </tbody> </table> 2) <table border="1" style="display: inline-table;"> <thead> <tr><th>Day</th><th>Population</th></tr> </thead> <tbody> <tr><td>0</td><td>200</td></tr> <tr><td>1</td><td>600</td></tr> <tr><td>2</td><td>1800</td></tr> <tr><td>3</td><td>5400</td></tr> </tbody> </table> </p>		Day	Population	0	1200	1	600	2	300	3	150	Day	Population	0	200	1	600	2	1800	3	5400	<p>3) Graph $f(x) = 2(3)^x$</p>  <p>Asymptote equation:</p>
Day	Population																					
0	1200																					
1	600																					
2	300																					
3	150																					
Day	Population																					
0	200																					
1	600																					
2	1800																					
3	5400																					
<p>4) Given the function $f(x) = \frac{1}{2} \cdot 4^{x-1}$, calculate $f(3)$.</p>	<p>5) The population of a town is 2500 and is increasing by 2.5% each year. Write a function to model this situation.</p>	<p>6) Hunter bought a car for \$6,000. If its value depreciates at a rate of 12.5% per year, write a function to model its value after t years.</p>	<p>7) The value of a rare coin can be modeled by the function $V(t) = 50(1.052)^t$. How many years will it take for the coin to double in value?</p>																			

Chapter 8 - Part 2 (Rationals)

<p>Simplify completely.</p> <p>29) $\frac{x^2 - 25}{x - 5}$ 30) $\frac{3x^2 - 27}{x + 3}$</p> <p>31) $\frac{3 - x}{5x - 15}$ 32) $\frac{5 - x}{2x^2 - 11x + 5}$</p>	<p>33) Simplify the product completely.</p> $\frac{x^2 + 3x}{x + 2} \cdot \frac{x^2 - 4}{x^2 + x - 6}$
--	--

<p>Simplify the quotients completely.</p> <p>34) $\frac{5x^4}{x + 7} \div \frac{6x^8}{3x + 21}$ 35) $\frac{\frac{a^7}{b^5}}{\frac{a^3}{b^8}}$ 36) $\frac{2x^3 - 18x}{x^2 - 2x - 8} \div \frac{x^2 + x - 12}{x^2 - 16}$</p>	<p>Simplify the sums completely.</p> <p>37) $\frac{3}{5x} + \frac{4}{3x}$</p> <p>38) $\frac{3}{x - 4} + \frac{2}{x}$</p>
---	---

State the excluded values and how many solutions there are. Solve the equation.

39) $1 + \frac{6}{x} = 2x$ 40) $\frac{6}{x} + \frac{5}{x - 5} = \frac{7}{x}$

<p>18) Solve $\log(x - 3) - \log 5 = \log 4$</p>	<p>19) Write both the exact and approximate solution to the equation:</p> $\ln(3x + 2) = 5$	<p>20) Write both the exact and approximate solution to the equation:</p> $e^{x-5} = 4$
---	---	---

ANSWERS 18) $\log \frac{x-3}{5} = \log 4$, $\frac{x-3}{5} = 4$, $x - 3 = 20$, $x = 23$ 19) $x = \frac{e^5 - 2}{3} \approx 48.8$ 20) $x = \ln(4) + 5 \approx 6.4$

Chapter 11: Statistics and Probability

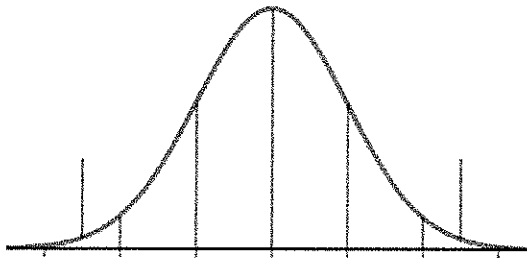
<p>A bag of marbles contains 6 green and 8 red marbles. Find each probability:</p> <p>1) P(green) =</p> <p>2) P(green, red) with replacement =</p> <p>3) P(green, red) without replacement =</p> <p>4) P(green, green) without replacement =</p>	<p>Consider the table of soft serve ice cream preferences of students by grade level. Calculate each probability.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Chocolate</th> <th>Vanilla</th> <th>Twist</th> <th>TOTAL</th> </tr> </thead> <tbody> <tr> <td>9th</td> <td>5</td> <td>8</td> <td>2</td> <td>15</td> </tr> <tr> <td>10th</td> <td>3</td> <td>9</td> <td>8</td> <td>20</td> </tr> <tr> <td>11th</td> <td>6</td> <td>11</td> <td>7</td> <td>24</td> </tr> <tr> <td>12th</td> <td>4</td> <td>14</td> <td>10</td> <td>28</td> </tr> <tr> <td>TOTAL</td> <td>18</td> <td>42</td> <td>27</td> <td>87</td> </tr> </tbody> </table> <p>3) Probability that a student chosen at random is a sophomore who prefers vanilla.</p> <p>4) Probability that a senior chosen at random prefers a twist.</p> <p>5) Probability that a student who prefers vanilla is a freshman.</p> <p>6) Probability that an upperclassman (11th or 12 grade) prefers chocolate.</p>		Chocolate	Vanilla	Twist	TOTAL	9th	5	8	2	15	10th	3	9	8	20	11th	6	11	7	24	12th	4	14	10	28	TOTAL	18	42	27	87
	Chocolate	Vanilla	Twist	TOTAL																											
9th	5	8	2	15																											
10th	3	9	8	20																											
11th	6	11	7	24																											
12th	4	14	10	28																											
TOTAL	18	42	27	87																											

<p>7) Some students were asked what number of pets they have. The data is displayed in the table. Which is true?</p> <p>A mean < median < mode</p> <p>B median < mode < mean</p> <p>C mode < mean < median</p> <p>D mode < median < mean</p>	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th># of Pets</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>7</td> </tr> <tr> <td>1</td> <td>3</td> </tr> <tr> <td>2</td> <td>5</td> </tr> <tr> <td>3</td> <td>4</td> </tr> <tr> <td>4</td> <td>2</td> </tr> <tr> <td>5</td> <td>2</td> </tr> </tbody> </table>	# of Pets	Frequency	0	7	1	3	2	5	3	4	4	2	5	2
# of Pets	Frequency														
0	7														
1	3														
2	5														
3	4														
4	2														
5	2														

<p>Write the inverse of each linear function.</p> <p>8) $f(x) = 5x - 7$ 9) $g(x) = \frac{3}{5}x + 2$</p>	<p>10) Write in exponential form and evaluate.</p> <p>a) $\log 1000$</p> <p>b) $\log_3 27$</p> <p>c) $\log_5 \frac{1}{25}$</p> <p>d) $\log_8 2$</p>	<p>11) Use log properties to rewrite each logarithmic expression as a single logarithm. *Also evaluate part c.</p> <p>a) $\log_3 x + 4\log_3 y$</p> <p>b) $5\log_7 a - 2\log_7 6$</p> <p>c) $2\log_6 3 + \log_6 4$</p>
<p>12) If $\log x^2 = 6$, what is the value of x?</p>	<p>15) Solve: $4^{x+6} = 64^{2x}$</p>	<p>17) Write both the exact and approximate solution of the equation:</p> <p>$5^x + 4 = 15.$</p>
<p>13) If $\log x = -3$, what is the value of x?</p>	<p>16) Solve: $3^{(x-2)} = 27^{5x}$</p>	
<p>14) Write both the exact and approximate solution to the equation: $\ln x = 3$</p>		
<p>8) $f^{-1}(x) = \frac{x+7}{5}$ or $f^{-1}(x) = \frac{1}{5}(x + 7)$ or $f^{-1}(x) = \frac{x}{5} + \frac{7}{5}$ 9) $g^{-1}(x) = \frac{5}{3}(x - 2)$ or $g^{-1}(x) = \frac{5}{3}x - \frac{10}{3}$ or $g^{-1}(x) = \frac{5x-10}{3}$</p> <p>10a) $10^x = 1000, x = 3$ 10b) $3^x = 27, x = 3$ 10c) $5^x = \frac{1}{25}, x = -2$ 10d) $8^x = 2, x = \frac{1}{3}$</p> <p>11a) $\log_3 xy^4$ 11b) $\log_7 \frac{a^5}{36}$ 11c) $\log_6(3^2 \cdot 4) = \log_6 36 = 2$ 12) $10^6 = x^2, x = \sqrt{10^6} = 1000$ 13) $10^{-3} = x = \frac{1}{10^3} = \frac{1}{1000}$ 14) $e^3 \approx 20.1$</p> <p>15) $x = \frac{6}{5}$ 16) $-\frac{1}{7}$ 17) $5^x = 11, \log 5^x = \log 11, x \cdot \log 5 = \log 11, x = \frac{\log 11}{\log 5} \approx 1.4899$</p>		

13) The 2001 NAEP Geography test scores were normally distributed for male students with a mean of 264 and a standard deviation of 34.

a) A score of 230 is _____ below the mean, while a score of 298 is _____ above the mean. This means that _____% of the scores were between 230 and 298.



b) A score of 332 is _____ above the mean. As a result, _____% of males scored a 332 or better.

c) You can infer that 99.85% of males scored a _____ or better.

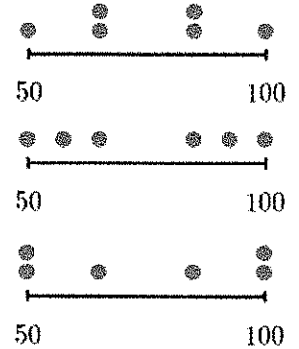
d) A score above _____ would be considered an outlier.

e) The probability of a randomly selected male student having a score between 196 and 264 is _____.

f) The probability of two randomly selected male students having a score between 298 and 332 is _____.

g) If 6,000 male students took the test, what number would you expect to have a score higher than a 298? _____

14) Rank the dot plots below according to standard deviation. 1 = lowest; 3 = highest. Explain how you know.



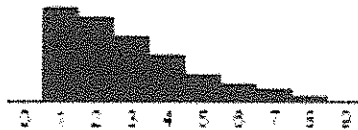
15) Describe the distribution shapes (skewness). Then compare the mean and median (=, <, >)

a)



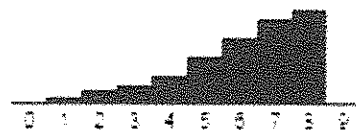
mean _____ median

b)



mean _____ median

c)



mean _____ median

- 13a) 1σ ; 1σ ; 68
- b) 2σ ; 2.5
- c) 162
- d) 336
- e) 0.475
- f) 0.18
- g) 960

14) 1, 2, 3

15a) symmetric; =

b) right skewed, >

c) left skewed, <

16) convenience; because of the location the people in the sample are more likely to say "Kohl's" than any other person in the general population

17) Volunteer; because of the location, the people in the sample are more likely to vote for the candidate than the general population because they are attending the rally.

Identify the sampling method. Then identify any bias in each method.

16) A local business owner wants to know where people in the community like to shop for clothes. She stands outside of Kohl's on a Saturday and asks people "where is your favorite place to shop for clothes?"

17) A political campaign wants to know how likely their candidate is to win the upcoming election. During the candidate's rally, the audience was asked to text in how likely they are to vote for the candidate.

8) The weight, in pounds, for 20 boxes in a truck were reported, and the mean, median, range, and standard deviation for the data were found. The box with the highest reported weight was actually found to weigh 12 pounds more than its reported weight. What value remains unchanged if the four statistical values are reported using the corrected weight?

- A Median B Mean
C Range D Standard Deviation

9) The minimum value of the data set consisting of 15 positive integers is 12. A new data set consisting of 16 positive integers is created by including 8 in the original data set. Which of the following measures must be 4 greater for the new data set than for the original data set?

- A Median B Mean
C Range D Standard Deviation

10) Consider the box plot at right.

Magnitude of earthquakes

a) $Q_1 =$ _____ $Q_2 =$ _____ $Q_3 =$ _____

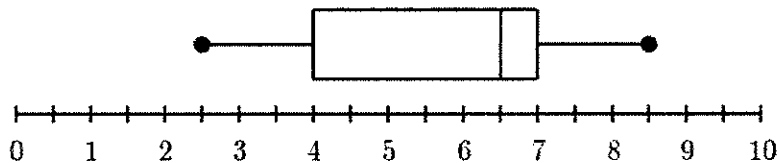
b) Find the Range. _____

c) Find the Interquartile Range. _____

d) What is the median magnitude of earthquakes? _____

e) 50% of the earthquakes have magnitudes lower than _____.

f) What percent of earthquakes have magnitudes greater than 7? _____



11) Temperatures in Gaylord that were recently recorded every hour for a 48-hour period were graphed in a box-and-whisker plot. The five number summary is shown below.

MIN	Q1	MED	Q3	MAX
32	58	70	73	85

a) Is the minimum temperature recorded considered an outlier by the $1.5 \cdot IQR$ rule? SHOW WORK.

b) What percent of temperatures were above 70 degrees?

c) What percent of temperatures were below 73 degrees?

d) What percent of temperatures were between 73 and 85 degrees?

12) For the data set below, write the 5-number summary. Determine if there are any outliers using the $1.5 \cdot IQR$ Rule.

16, 29, 29, 32, 34, 37, 43, 75

8) A 9) C

10) 4; 6.5; 7; range=6; IQR=3; med=6.5; 6.5; 25%

11a) Lower fence is < 35.5 ; yes, 32 is an outlier

11b) 50% 11c) 75% 11d) 25%

12) 16; 29; 33; 40; 75; 75 is an outlier

