Chapter 6 (Part 2) Exam Review
Algebra 1B

1. Write in a + bi form: \((8 - 4i) + (3 + 8i)\)
\[
\frac{8 - 4i + 3 + 8i}{11 + 4i}
\]

2. Write \(3(4 + 8i) + (2 + i)(-4 + 9i)\) in a + bi form.
\[
\frac{12 + 24i - 8 + 18i}{-5 + 38i}
\]

3. Write in a + bi form: \((3 + 2i)(4 - 9i)\)
\[
\frac{12 - 27i + 8i}{30 - 19i}
\]

4. Write in a + bi form: \(\frac{\sqrt{-36}}{\sqrt{-9}}\)
\[
\frac{6i}{3} = \frac{6}{3} = 2 + 0i
\]

5. Write in a + bi form: \(\sqrt{-169} \cdot \sqrt{-25}\)
\[
\frac{13i \cdot 5i}{60i^2} \rightarrow -65 + 0i
\]

6. Write in a + bi form: \(\frac{8 \pm \sqrt{16}}{4}\)
\[
\frac{8 \pm 4i}{4} \rightarrow 2 \pm i
\]

7. Multiple Choice: Simplify \(-\sqrt{(-8x)^2}\)
   a. \(8x\)
   b. \(8x^2\)
   c. \(-8x\)
   d. \(-8x^2\)
8. Solve: \( x^2 + 4 = -12 \)

9. What is the value of \( i \)?

\[ \sqrt{-1} \]

10. Simplify \( \frac{4 + i}{5 + 2i} \cdot \frac{5 - 2i}{5 - 2i} = \frac{20 - 8i + 5i}{25 - 10i + 10i - 4i^2} + 4 = \frac{22 - 3i}{29} \)

11. Simplify \( \frac{3 + 4i}{6 - 2i} \). Write your answer in \( a + bi \) form.

\[ \frac{1 + 3i}{4} \rightarrow \frac{1}{4} + \frac{3i}{4} \]

\[ \frac{18 + 6i + 24i + 8i^2}{36 + 12i - 12i - 4i^2} = \frac{10 + 30i}{40} \text{ cont.} \]
Chapter 7 Exam Review
Algebra 1B

1. Multiple Choice. \((\frac{4}{3})^{-3}\) = \[\frac{4^{-3}}{3^{-3}} = \frac{3^3}{4^3} = \frac{27}{64}\]
   a) -4/3  b) -3/4  c) 64/27  d) 27/64

2. Simplify \((10a^4)^{-2} \cdot (5ab^2)^3\). Your answer should contain only positive exponents.
   \[\frac{1}{100a^10} \cdot 125a^3b^6 = \frac{125a^3b^6}{100a^{10}} = \frac{5b^6}{4a^7}\]

3. Simplify \((\frac{81}{16})^{-\frac{3}{4}}\) = \[\frac{81^{-3/4}}{16^{-3/4}} = \frac{16^{3/4}}{81^{3/4}} = \frac{8}{27}\]

4. Find all real solutions to \(\frac{4x^{1/4}}{4} = 16\) → \((x^{1/4})^4 = (4)^4\) → \(x = 2560\)

5. Find all real solutions to \((m^{-3/4})^{-3/4} = 625\) → \(m = 625^{-3/4} = \frac{1}{625^{3/4}}\)
   \(m = \frac{1}{125}\)

6. Find all real solutions to \(8x^4 = 648\) → \((x^4)^{1/4} = (81)^{1/4}\) → \(x = \pm 3\)

7. The formula \(h = 349 \cdot 10^{-15/50}\) gives the number of hours \(h\) that milk stays fresh when stored in a temperature of \(t\) degrees Celsius. How long would milk stay fresh at 15 degrees Celsius?
   \(h = 349 \cdot 10^{-15/50} = 174.9\) hrs (7 days)
8. Sketch a graph of each of the following
   a. \( y = x^n \), where \( n \) is an even integer.
   
   b. \( y = -x^n \), where \( n \) is an even integer.
   
   c. \( y = x^n \), where \( n \) is an odd integer.
   
   d. \( y = -x^n \), where \( n \) is an odd integer.

9. Samuel currently has $1000 in a savings account that pays 3.4% interest compounded quarterly.\\ \[ \frac{n = 4}{P} \quad \frac{r = .034}{t} \]
   
   a. How much will be in his account in five years?
   \[ A = P \left(1 + \frac{r}{n}\right)^{nt} \rightarrow A = 1000 \left(1 + \frac{.034}{4}\right)^{4 \cdot 5} = $1184.45 \]

   b. How much total interest did he earn in the five years?
   \[ 1184.45 - 1000 = $184.45 \]

   c. If he opened his account three years ago and hasn't made any additional deposits since, how much did he have when he opened his account?
   \[ A = 1000 \left(1 + \frac{.034}{4}\right)^{4 \cdot -3} = $903.42 \]

10. Simplify \( \frac{(a^{-6}b^8)^{-\frac{1}{3}}}{a^{-3}b^{\frac{1}{3}}} \). Your answer should contain only positive exponents.
   \[ \frac{a^2 b^{-8/3}}{a^{-3} b^{1/3}} = a^5 b^{-9/3} = \left(\frac{a^5}{b^3}\right) \]
11. a. Identify the domain of the function.
   \[ \mathbb{R} \]

   b. Identify the range of the function.
   \[ \mathbb{R} \geq 0 \]

   c. Name three coordinates on the graph of this function.
   Sample: \((0,0), (1,1), (2,6.4)\)

12. Evaluate \(625^{\frac{-3}{4}}\) without using a calculator.
   \[ (625^{\frac{1}{4}})^{-1} = (5^{5})^{-1} = 3125^{-1} = \frac{1}{3125} \]

13. Simplify \(\frac{-3x^4y^3z^4}{12x^3y^2}\). Your answer should contain only positive exponents.
   \[ -3x^{-1}y^3z^4 \rightarrow \frac{-3y^3z^4}{x^4} \]

14. Simplify \(\left(\frac{1}{p}\right)^{\frac{1}{2}}\).
   \[ \rightarrow \left(\frac{p}{1}\right)^{\frac{1}{2}} = \frac{p^{1/2}}{1^{1/2}} = p^{1/2} \]

15. Simplify \((-2x^3y)^3\).
   \[ (-2)^3 = -8 \]

16. Simplify \((4m^3n^2)^{-2}\).
   \[ 4^{-2} = \frac{1}{16} \]
17. Calculate each of the following:

   a. \( (729)^{\frac{1}{2}} = \frac{27}{\emptyset} \)
   b. \( (-729)^{\frac{1}{2}} = \emptyset \)
   c. \( -729^{\frac{1}{2}} = -\frac{27}{\emptyset} \)
   d. \( (729)^{\frac{1}{3}} = \frac{9}{\emptyset} \)
   e. \( (-729)^{\frac{1}{3}} = \frac{-9}{\emptyset} \)
   f. \( -729^{\frac{1}{3}} = \frac{-9}{\emptyset} \)

18. Simplify \( \frac{(x^6 y^{-3})^{\frac{2}{3}}}{xy^2} = \frac{x^4 y^{-2}}{xy^2} = x^3 y^{-4} = \frac{x^3}{y^4} \).
Chapter 8 Exam Review
Algebra 1B

1. Multiple Choice. For \( n > 0 \), \( \left( \frac{1}{n} \right)^{\frac{3}{4}} = ? \) → \( \frac{1}{n^{-\frac{3}{4}}} \) = \( \frac{n^{\frac{3}{4}}}{1^{\frac{3}{4}}} \) → \( n^{\frac{3}{4}} \) → \( \sqrt[4]{n} \)
   a) \( (\sqrt[n]{n})^3 \)
   b) \( -n^{\frac{3}{4}} \)
   c) \( -n^{\frac{3}{4}} \)
   d) \( (\sqrt[n]{n})^4 \)

2. Multiple Choice. Which of the following is NOT equivalent to \( \sqrt[4]{n^2} \) ? = \( n^{\frac{8}{4}} = n^2 \)
   a) \( x^{\frac{3}{4}} = x^2 \)
   b) \( \sqrt[3]{x^6} = x^{2} \)
   c) \( x^2 \)
   d) \( x^{\frac{3}{2}} = x^{\frac{3}{2}} \)

3. Evaluate \( (\sqrt{15} - \sqrt{32})(\sqrt{15} + \sqrt{32}) \).
   \[ \sqrt{15} \cdot \sqrt{15} + \sqrt{15} \cdot \sqrt{32} - \sqrt{15} \cdot \sqrt{32} - \sqrt{32} \cdot \sqrt{32} \]
   \[ 15 - 32 = -17 \]

4. Simplify \( \sqrt{16,807m^3} \).
   \[ 7 \cdot 7 \cdot m \cdot m \cdot \sqrt{7m} = 49m^2 \sqrt{7m} \]

5. Simplify \( \sqrt{x^6y^{10}z^3} \).
   \[ x^6 \rightarrow 3 \text{ pairs, no leftovers} \]
   \[ y^{10} \rightarrow 5 \text{ pairs, no leftovers} \]
   \[ z^3 \rightarrow 1 \text{ pair, 1 leftover} \]
   \[ x^3y^5z \sqrt{z} \]

6. Evaluate \( \sqrt{-125} \).
   \[ -5 \]
7. Solve \(2\sqrt{x+3} = -8\) → \(\left(\frac{3}{\sqrt{x+3}}\right)^3 = (-4)^3\)
   \[ x + 3 = -64 \] → \(x = -67\)

8. Solve \(\frac{4\sqrt{2x}}{3} = 12\) → \(\left(\frac{4\sqrt{2x}}{3}\right)^4 = (2)^4\) → \(2x = 16\) → \(x = 8\)

9. Simplify \(\sqrt[12]{x}^3\). → \(x^{12/3} = x^4\)

10. Rewrite \(\sqrt[3]{x^5}\) using a rational exponent. → \(x^{9/2}\)

11. Solve \(-\frac{3\sqrt{2x} - 5}{3} = 9\)
   \[ (3\sqrt{2x - 5})^3 = (-3)^3 \]
   \[ 2x - 5 = -27 \] → \(x = -11\)

12. Simplify \(\sqrt{600m^{11}}\).
   \[ 2\cdot 5 \cdot \sqrt{23 \cdot m} \]
   \[ 10m^{5} \sqrt{6m} \]
Chapter 9 Exam Review
Algebra 1B

1. Consider the function $f$ defined by $f(x) = 6^x$.
   a. What is the domain of $f$? $\mathbb{R}$
   b. What is the range of $f$? $\mathbb{R}^+$

2. Multiple Choice: Which equation defines an exponential-growth function?
   a. $y = \left(\frac{1}{7}\right)^{-x} = 7^x$
   b. $y = x^7$
   c. $y = 7x$
   d. $y = 7^{-x} = \left(\frac{1}{7}\right)^x$

3. Multiple Choice: Which equation defines an exponential-decay function?
   a. $y = x^3$
   b. $y = \left(\frac{1}{3}\right)^{-x} = 3^x$
   c. $y = 3^{-x} = \left(\frac{1}{3}\right)^x$
   d. $y = 3x$

4. Multiple Choice: Which could be the graph of $y = ab^x$ where $a > 0$ and $b < 1$?
   $\rightarrow$ decay

   A.  
   B.  
   C.  
   D.  

5. A new car costing $11,000 is predicted to depreciate at a rate of 15% per year. About how much will the car be worth in 8 years?

\[
y = 11,000 \times (0.85)^8 = 2997.40
\]

6. Solve \(6 \cdot 4^t = \frac{6}{16}\). If necessary, round to the nearest hundredth.

\[
4^t = \frac{1}{16} \quad \Rightarrow \quad 4^2 = 16, \quad - \exp \text{ to flip}
\]

\[
t = -2
\]

7. Solve \(5 \cdot 2^t = \frac{5}{8}\). If necessary, round to the nearest hundredth.

\[
2^t = \frac{1}{8} \quad \Rightarrow \quad 2^3 = 8, \quad - \exp \text{ to flip}
\]

\[
t = -3
\]

8. Solve \(8^t = 19.4\). If necessary, round to the nearest hundredth.

\[
\log 8^t = \log 19.4 \quad \Rightarrow \quad r \cdot \log 8 = \log 19.4
\]

\[
r \approx 1.43
\]

9. Write the equivalent logarithmic form for \(216^{\frac{1}{3}} = \frac{1}{1296}\).

\[
\log_{216} \left(\frac{1}{1296}\right) = -\frac{1}{3}
\]

10. Write the equivalent exponential form for \(\log_{16} 50 = 3.91\).

\[
10^{3.91} \approx 50
\]

11. Write the equivalent logarithmic form for \(36^{\frac{1}{2}} = \frac{1}{216}\).

\[
\log_{36} \left(\frac{1}{216}\right) = -\frac{3}{2}
\]

12. Evaluate \(\log_5 \sqrt{5}\) exactly without using a calculator.

\[
\log_5 \sqrt{5} = ? \quad \Rightarrow \quad 5^{\frac{1}{2}} = \sqrt{5} \quad \Rightarrow \quad 5^{\frac{1}{2}} = 5^{\frac{1}{2}}
\]

\[
\frac{1}{2}
\]

13. Evaluate \(\log_7 343\) exactly without using a calculator.

\[
\log_7 343 = ? \quad \Rightarrow \quad 7^3 = 343 \quad \Rightarrow \quad \text{guess/check} \quad 7^3 = 343
\]

\[
3
\]
14. Solve \( \log_{10} x = 6 \).

\[ 10^6 = x \rightarrow x = 1,000,000 \]

15. Give the exact value of \( \log_{.10} .01 \).

\[ 10^{-2} = .01 \]

16. Evaluate to the nearest thousandth: \( \log 5.925 \).

Calc: \( .773 \)

17. Solve \( \log x = 8 \).

\[ 10^8 = x \rightarrow x = 100,000,000 \]

18. Under optimal environmental conditions, a certain bacteria in a sample of milk will double every 42 minutes. A scientist is investigating a sample of 1000 bacteria.

a. Write an equation to represent the bacteria population after \( t \) minutes.

\[ y = 1000(2)^{t/42} \]

b. Use your equation to determine how many bacteria there will be in 5 hours.

\[ y = 1000(2)^{300/42} = 141,323 \text{ bacteria} \]

19. Canada’s population in 2010 was measured at 34,238,000 people. Over the past few years the population has grown at a rate of approximately 1.3%.

a. Write a model to represent Canada’s population \( P \) after \( t \) years.

\[ P = 34,238,000(1.013)^t \]

b. Assuming the growth rate stays the same, what will the population be in the year 2022?

\[ t = 12 \text{ yrs} \]

\[ 34,238,000(1.013)^{12} = 39,978,061 \]

c. Again, assuming the growth rate remains the same, what was the population in 1992?

\[ t = -18 \text{ yrs} \]

\[ 34,238,000(1.013)^{-18} = 27,135,534 \]
Chapter 10 Exam Review
Algebra 1B

1. Find the exact value of $\sin 30^\circ$.
   \[
   \frac{1}{2}
   \]

2. Find the exact value of $\cos 390^\circ$.
   \[
   \frac{\sqrt{3}}{2}
   \]

3. Find the exact value of $\tan 135^\circ$.
   \[
   -1
   \]

4. Find the exact value of $\tan 330^\circ$.
   \[
   -\frac{\sqrt{3}}{3}
   \]

5. Find the exact value of $\sin 390^\circ$.
   \[
   \frac{1}{2}
   \]

6. Find the exact value of $\cos 30^\circ$.
   \[
   \frac{\sqrt{3}}{2}
   \]

7. What is $\sin 24^\circ$ to the nearest thousandth?
   \[
   0.407
   \]

8. Find two values of $\theta$ such that $0^\circ < \theta < 360^\circ$ and $\sin \theta = \frac{\sqrt{3}}{2}$.
   \[
   60^\circ, 120^\circ
   \]

9. Find all $\theta$ between $0^\circ$ and $180^\circ$ for which $\cos \theta = \frac{1}{2}$.
   \[
   60^\circ
   \]

10. Multiple Choice: Which of the following is a true statement?
    
    a. $\cos 124^\circ = \cos 56^\circ$
    
    b. $\cos 236^\circ = \cos 560^\circ$
    
    c. $\cos 236^\circ = \cos 124^\circ$
    
    d. $\cos 236^\circ > 0$
11. Use the unit circle below. Which letter stands for the given number?
   a. \( \cos(-270^\circ) \)
      \[ \text{r} \]
   b. \( \sin \frac{5\pi}{3} \)
      \[ \text{n} \]

12. Convert \( 260^\circ \) to radians.
   \[ \frac{260 \times \pi}{180} = \frac{13 \pi}{9} \]

13. Convert \( 220^\circ \) to radians.
   \[ \frac{220 \times \pi}{180} = \frac{11 \pi}{9} \]

14. Convert \( -\frac{3\pi}{4} \) radians to degrees.
   \[ \frac{\pi}{180} = \frac{3\pi/4}{x} \rightarrow \frac{\pi \times x}{180} = \frac{3\pi/4 \times 180}{x} \]

15. Convert \( \frac{4\pi}{3} \) radians to degrees.
   \[ \frac{4\pi}{3} \times x = \frac{4\pi/3 \times 180}{x} \rightarrow x = 240^\circ \]

16. A wheelchair ramp is to be built with a slope of 1/6. What angle will the ramp make with the horizontal?
   \[ \tan \theta = \frac{1}{6} \]
   \[ \tan^{-1}(1/6) = 9.5^\circ \]

17. An airplane is flying at an altitude of 8,000 feet. The pilot wants to make a smooth final descent to the runway at a constant angle of depression of 4\(^\circ\). How far from the runway should the pilot begin the descent?
   \[ \tan 4^\circ = \frac{8000}{x} \]
   \[ x = \frac{8000}{\tan 4^\circ} = 21.7 \text{ mi} \]

18. A 20-foot ladder leaning against a wall forms an angle of 55\(^\circ\) with the ground. How far from the base of the wall is the bottom of the ladder?
   \[ \cos 55 = \frac{x}{20} \rightarrow 20 \cdot \cos 55 = x \]
   \[ 11.5 \text{ ft} = x \]
19. A wheelchair ramp at the entrance to a building forms an angle of $8^\circ$ with the ground. If the ramp is 20.5 ft long, how far from the base of the building is the bottom of the ramp?

\[
\cos 8^\circ = \frac{x}{20.5} \quad \rightarrow \quad 20.5 \cdot \cos 8^\circ = x
\]

\[
20.3 \text{ ft} = x
\]

20. Multiple Choice: Which equation illustrates the Law of Sines for $\triangle XYZ$ at the right?

a. $\sin X = \frac{x}{y}$

b. $\frac{\sin X}{x} \cdot \frac{\sin Y}{y} \cdot \frac{\sin Z}{z} = 1$

c. $(\sin X)(\sin Y)(\sin Z) = 1$

d. $\frac{\sin X}{x} = \frac{\sin Y}{y} = \frac{\sin Z}{z}$

21. Multiple Choice: Which equation illustrates the Law of Cosines for $\triangle XYZ$ at the right?

a. $z^2 + x^2 + y^2 = 2xy\cos Z$

b. $\cos X = \frac{z}{y}$

c. $(\cos X)(\cos Y)(\cos Z) = 1$

d. $z^2 = x^2 + y^2 - 2xy\cos Z$

22. Find $x$ to the nearest tenth.

\[
x^2 = 4^2 + 6^2 - 2 \cdot 4 \cdot 6 \cdot \cos 60^\circ
\]

\[
x^2 = 28 \quad \rightarrow \quad x = 5.3
\]

23. Find $x$ to the nearest tenth.

\[
17^2 = 28^2 + 35^2 - 2 \cdot 28 \cdot 35 \cdot \cos x
\]

\[
289 = 2009 - 1960 \cos x
\]

\[
-1720 = -1960 \cos x \quad \rightarrow \quad 0.8776 = \cos x
\]

\[
\cos^{-1}(0.8776) = 28.7^\circ
\]
24. Find \( x \) to the nearest tenth.

\[
\frac{\sin 57}{14} = \frac{\sin 97}{x} \Rightarrow x \cdot \sin 57 = 14 \cdot \sin 97 \cdot \frac{\sin 57}{\sin 57} = 160.6
\]

25. An airplane pilot cruising at 38,000 feet receives instructions from air traffic control directing him to begin his descent when he is 100 miles from the airport. The pilot knows that in order to have a smooth descent, he must not descend at an angle greater than 5°. Will air traffic control's directions allow for a smooth, non-turbulent landing? Explain.

\[
\tan \theta = \frac{7.2}{100} \Rightarrow \tan^{-1} \left( \frac{7.2}{1000} \right) = 4.1^\circ
\]

26. A 3.5-foot-tall boy gets his kite stuck at the top of a tree. He is standing 25 feet from the base of the tree. He can see his kite at an angle of 38°.

**a. How tall is the tree?**

\[
\tan 38 = \frac{x}{25} \Rightarrow x = 19.5 + 3.5 = 23 \text{ ft}
\]

**b. How long is the string leading from the boy's hand to the kite?**

\[
y = \frac{25}{\cos 38} \Rightarrow y = 31.7 \text{ ft}
\]

27. Two trains depart from a common station. The tracks they are traveling on form a 130° angle. One train travels at a speed of 72 mph, while the other travels at a rate of 84 mph. After six hours, how far apart are the two trains?

\[
a^2 = 432^2 + 504^2 - 2 \cdot 432 \cdot 504 \cdot \cos 130\degree
\]

\[
a = 848.9 \text{ mi}
\]
Chapter 11 Exam Review
Algebra 1B

1. Factor \(12x^2 + 35x + 18\) over the set of polynomials with integer coefficients.

Consider the function \(f(x) = 18x^3 - 3x^2 - x\).

a. Factor \(f(x)\).

b. Find all zeros of \(f(x)\).

3. Write \((3x+4)^2\) in standard form.
   \[
   (3x + 4)(3x + 4) \rightarrow 9x^2 + 24x + 16
   \]

4. Multiple Choice. Which of the following polynomials is a trinomial?
   a) \(x^3 + 5\)  
   b) \(4x^3\)  
   c) \(3x + 2\)  
   d) \(x^2 + 3x + 1\)

5. If the length of each edge of a cube is \(x + 3\), find a polynomial formula for the volume of the cube.
   \[
   V = \ell \cdot w \cdot h = (x+3)(x+3)(x+3) \rightarrow V = (x + 3)^3 = x^3 + 9x^2 + 27x + 27
   \]

6. Consider the polynomial function \(P\) with equation \(P(x) = 15x^3 - 25x + 13x^17\).
   a. What is the degree of the polynomial? \(17\)
   b. What is the leading coefficient of the polynomial? \(13\)

   Standard form \(13x^{17} + 15x^3 - 25x\)
7. Factor $2p^2 - 12p - 182$ completely over the set of polynomials with integer coefficients.

\[ (p^2 - 6p - 91) \quad 2(p + 7)(p - 13) \]

8. Factor $81m^4 - 25$ completely over the set of polynomials with integer coefficients.

\[ (9m^2 + 5)(9m^2 - 5) \]

9. Factor $x^2 - 9y^2$ completely over the set of polynomials with integer coefficients.

\[ (x + 3y)(x - 3y) \]

10. Consider the polynomial $P(x) = 13x^7 - 23x + 11x^2$.

   a. What is the degree of the polynomial?

   \[ 15 \]

   b. What is the leading coefficient of the polynomial?

   Standard → $11x^7 + 13x^7 - 23x$

   \[ 11 \]

11. Write a polynomial expression to represent the area of the rectangle at the right.

   \[ A = \text{length} \times \text{width} \]

   \[ A = (x + 3)(x + 2) \]

   \[ = x^2 + 5x + 6 \]

12. Factor the expression completely: $36x^5y^8 + 60x^9y^5 + 84x^{10}y^7$

   \[ 12x^5y^5(3y^3 + 5x^4 + 7x^5y^2) \]

13. Factor the expression completely: $5m^3 + 25m^2 - 30m$

   \[ 5m(m^2 + 5m - 6) \]

   \[ 5m(m + 6)(m - 1) \]

14. A box is folded from a sheet of cardboard 20 in by 30 in by cutting squares of side length $x$ from each corner. Write a simplified expression for the volume of the box.

   \[ V = \text{length} \times \text{width} \times \text{height} \]

   \[ V = (20 - 2x)(30 - 2x)x \]

   \[ V = (600 - 40x - 60x + 4x^2)x \]

   \[ V = (600 - 100x + 4x^2)x \]

   \[ V = 4x^3 - 100x^2 + 600x \]