Precal Review for AP Calculus Name:_____

Topic A
Simplifying Expressions

Simplify.

1. $(2x - 3)(x + 5)$
2. $(x^3 - 1)(x^3 + 1)$
3. $(2x + 4)^2$

Simplify. Leave no negative exponents in your final answer.

4. $(3xy^5)^4$
5. $(7xy^2)^0$
6. x^{-3}
7. $3x^{-2}$
8. $(3x^{-2})^3$
9. $(3x^2)^{-4}$
10. $\left(\frac{x^3}{y^4}\right)^{-5}$

Simplify by rationalizing the denominator.

11. $\frac{8}{\sqrt{3}}$
12. $\frac{4x+2}{\sqrt{x-1}}$
13. $\frac{2}{1-\sqrt{x}}$

Simplify by rewriting with no radical signs.

14. $\sqrt[3]{x^2}$
15. $\sqrt[5]{x^8}$

Simplify by rewriting with no fractional exponents.

16. $x^{6/5}$
17. $x^{4/9}$

Topic B
Fraction Basics

Simplify.

1. $\frac{3x+6}{3}$
2. $\frac{6x+3}{3x}$
3. $\frac{2+1/2}{1+3/5}$
4. $\frac{\frac{1}{x}+\frac{1}{3}}{1+\frac{1}{6x}}$

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Topic C
Solving Algebraic Equations

Solve.

1. $2x^2 + 5 = 13$

2. $5x + 2(x + 4) = -6$

3. $5x + 5 = 2x - 1$

4. $80 = 10(3t + 2)$

5. $5[2 + 3(x+1)] = 4$

Solve the following for r.

6. $SA = 4\pi r^2$

7. $V = h(\pi - r)^2$

Topic D
Factoring

Factor.

1. $5x^4 - 20x^3$

2. $-2x^3 + 6x^2 - 10x$

3. $x^2 + 8x + 15$

4. $2x^2 + 34x - 220$

5. $12x^2 + 23x + 10$

6. $3x^2 + 10x - 8$

7. $x^2 + 6x + 9$

8. $x^2 - 25$

9. $4x^2 - 16$

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Topic E
More Fractions

Simplify and reduce.

1. $4x+\frac{3x+2}{3}$

2. $\frac{4x+2}{3}\cdot\frac{6x}{x+1}$

3. $\frac{x+1}{x}\div\frac{2x+2}{x}$

4. $\frac{x+3}{3x}\div\frac{x-1}{2x}$

5. $\frac{3}{x-1}+\frac{4}{x-2}$

6. $\frac{2x-1}{x}-\frac{3x}{x-2}$

Topic F
Linear Equations and Systems

1. Determine the equation of a line with a slope of $\frac{-2}{3}$ and a y-intercept of (0, 4).

2. Determine the equation of a line with a slope of 2 and passes through the point (1,3).

3. Determine the equation of a line that goes through (1, 6) and (-3, 5).

4. Determine the equation of a line that goes through (-1, -5) and that is parallel to 3x + y = -4.

5. Determine the equation of a line that goes through (1, 1) and that is perpendicular to –2x + y = 6.

Find the slope and y-intercept of each line.

6. $\frac{5}{2}x+1=y$

7. 5x + 4y = 4

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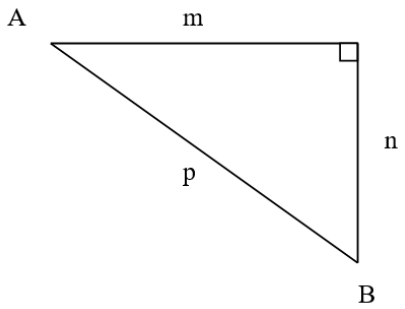
Solve the following systems by hand, then check your answer in the calculator by finding the intersection point.

8. x + y = 3
   5x – y = -27

9. 3x + 3y = 15
   2x + 6y = 22

Topic G
Trigonometry

Use the diagram at the right to express each ratio.



1. sin (A)
2. cos (B)
3. tan (A)
4. sec (B)
5. cot (A)
6. csc (B)

Topic G (cont'd.)

Prove the following trig identities. SHOW WORK!

7. $\tan\theta \cdot \sin 2\theta = 2\sin^2\theta$
8. $\sin\theta \cdot \tan\theta + \cos\theta = \sec\theta$

Solve for *x without* the help of a calculator.

9. $\cos\frac{\pi}{3} = x$
10. $\sin\frac{7\pi}{6} = x$
11. $\cos\frac{7\pi}{6} = x$
12. $\sin\frac{\pi}{3} = x$
13. $\sec\frac{5\pi}{3} = x$
14. $\tan\frac{5\pi}{4} = x$
15. $\cot\frac{-\pi}{6} = x$

Graph one cycle of the following equations.

16. $y = 3\sin[\frac{1}{2}(x+\pi)] - 2$
17. $y = \cos(\pi x) + 3$

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Topic H
Solving Trig Equations

Solve the following *without* the help of a calculator. Answers should be exact (no decimal approximations, please). Restrict x to: $0 \leq x < 2\pi$.

1. $\cos x = 0$
2. $\sin x = \frac{\sqrt{3}}{2}$
3. $\sin x = -1$
4. $\cos x = -1$

5. $\tan x = -1$
6. $\sin^2 x - \sin x = 0$
7. $2\cos^2 x - 1 = 0$

Calculator Problem: Solve the following graphically. Give only the two solutions that are *closest* to the origin.

8. $\cos(3x) = \sin(x^3)$
9. $\sin^2(x + 1) = \log(x) \cdot \tan(x)$

Topic I
Quadratic Equations

Find the roots by *factoring*.

1. $y = x^2 - 3x - 10$
2. $y = x^2 - 2x + 1$

Find the roots by using the *quadratic formula*.

3. $y = x^2 + 5x - 1$
4. $y = -3x^2 + 2x + 10$

Topic J
Absolute Value Equations

Solve the following algebraically.

1. $|4x + 1| = 20$
2. $|x^2 - 3| = 8$
3. $|-x - 4| = 10$

Rewrite the following as piece-wise functions.

4. $y = | 4x - 5 |$

5. $y = | 8 - 3x |$

Graph the following.

6. $y = | x^2 + 2x - 3 |$

7. $y = | \cos(2x) |$ on $[0, 2\pi]$

8. $y = | x - 1 |$

Topic K
Rational Equations

Solve the equation algebraically. Remember to eliminate extraneous solutions.

1. $\frac{3x-6}{x+4} = 0$

2. $\frac{x^2+9x+8}{x+1} = 0$

3. $\frac{2x^3+3x^2}{x^3-4x} = 0$

Topic L
Logarithmic and Exponential Equations

Solve the following *without* the help of a calculator.

1. $\log_3 81 = x$

2. $\log_x 25 = 2$

3. $\log x = 3$

4. Give the inverse of $y = \log_3 x$.

Rewrite the following strictly in terms of log 3 and/or log 2.

5. log 12

6. log 18

7. $\log(0.\overline{6})$

Solve the following algebraically. Give an exact answer. Eliminate any extraneous solutions.

8. $e^{3x} = 19$

9. $\log (3x^2 - 2) = 1$

10. $5^{(x-2)} = 250$

Topic M
Functions and Relations

State the domain of each of the following functions.

1. $y = \sqrt{x+2}$

2. $y = \sqrt{x^2+5x+6}$

3. $y = \dfrac{x^2+5}{x^2+6x}$

4. $\dfrac{x}{\sqrt{x-1}}$

5. $y = \log (3x - 6)$

6. $y = (x + 2)(x + 5)(x^2 - 3)$

Topic N
Asymptotes and End Behavior

Find the asymptotes (horizontal, vertical, oblique) and any removeable discontinuities of the following functions.

1. $y = \dfrac{x+5}{x^2-3x}$

2. $y = \dfrac{x^2+2x+3}{x+1}$

3. $y = \dfrac{2x^2+4x+9}{5x^2+10x}$

4. $y = \dfrac{x^2+2x-3}{x-1}$

5. $y = \dfrac{x^2+4x+4}{x^2-4}$

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Topic O
Inverse Functions

Find the inverse of each function algebraically. Show your work.

1. $y = 3x + 2$
2. $y = \frac{1}{2}x - 6$
3. $y = x^2 + 5$
4. $y = \sin x$

Topic P
Inverse Trig Functions

Evaluate. Use restricted domains.

1. $\sin^{-1}\frac{1}{2}$
2. $\tan^{-1}(-\sqrt{3})$
3. $\csc^{-1} 2$
4. $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

Topic Q
Transformations of Parent Functions

Graph the following accurately. At least 3 points must be marked on your graph.

1. $y = 2x^2 - 3$
2. $y = \frac{2}{x-3}$
3. $y = 2\sqrt[3]{x-1}+3$
4. $y = -2\ln(x+3)$