

SAMPLE TEST: PRECALCULUS

(130)
(135)
(140)

Topic I - RATIONAL EXPRESSIONS

1. Divide and simplify $(x - \frac{1}{x}) \div (1 - \frac{1}{x})$
2. Perform the indicated operations and simplify $\frac{\frac{2}{x} - 1}{x^2 - 4}$
3. Simplify $\frac{5u^2 - 4v}{v^3} \cdot \frac{uv}{3v^2}$
4. Subtract and simplify $\frac{10}{x^2 - 4} - \frac{3 - x}{x^2 + 2x}$
5. Add and Simplify $\frac{1}{(a-b)(a+2b)} + \frac{1}{(a+2b)(a-3b)} + \frac{1}{(a-3b)(a-b)}$
6. Perform the indicated operations and simplify $(\frac{x}{y} - \frac{y}{x})^{-1}$
7. Divide and simplify $\frac{\frac{a^2b}{a-b}}{\frac{a+b}{a^2-b^2}}$
8. Perform the indicated operations and simplify $\frac{\frac{x}{x-3} - \frac{2x}{x^2-2x-3}}{\frac{2}{x+1} - \frac{1}{x}}$

Topic II - EXPONENTS AND RADICALS

1. Evaluate $32^{-3/5}$
2. Simplify $\sqrt{10}\sqrt{15}$
3. Simplify $\sqrt{(u^2 - v^2)(u + v)}, u > v > 0$
4. Simplify $\sqrt{16x^2 + 36y^2}$
5. Simplify $\frac{(5ab^2)(2a^3b)^2}{a^3b^2}$
6. Simplify $\frac{x^{-2}y^3z}{x^{-1}y^{-2}z^0}$
7. Simplify $\frac{x^{u^2-3}}{x^{u-3}}$
8. Simplify $(x^{a-1})^{a+1}$

9. Rationalize $\frac{a}{\sqrt[3]{4}}$

10. Simplify $\frac{9^4 x^{3/2} y^{5/2}}{81^6 x^{-1/2} y^{-1}}$

11. Simplify $(-27x^{12}y^{-18})^{-2/3}$

12. Simplify $\sqrt[4]{a^6} - 2a\sqrt{a}$

13. Simplify and express without radicals $\frac{\sqrt{x}}{\sqrt[4]{x}}$

14. Simplify $\sqrt{18} - 3\sqrt{8} + \sqrt{50}$

Topic III - LINEAR EQUATIONS, INEQUALITIES, AND ABSOLUTE VALUE

1. Solve for x: $x = \frac{m}{n}x + 2$

2. Solve for a: $\sqrt{a-1} - 2 = 2$

3. Solve for x: $\frac{2}{x} - \frac{2}{2x+1} = \frac{1}{x+1}$

4. Solve the system of equations for x and y:

$$3x + 5y = -7$$

$$4x - 2y = 8$$

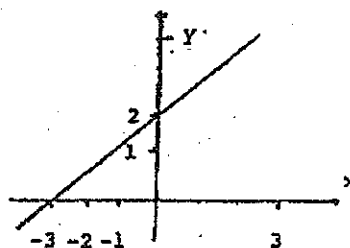
5. Solve the system of equations for x and y:

$$5x = 3y$$

$$3x + 2y = 21$$

6. If a = -2 then evaluate: $|a - 1| = |-a| + 1$

7. Find the equation of the line in the figure shown.



8. Solve for x : $|4 - 3x| \leq 7$

Topic IV - POLYNOMIALS AND POLYNOMIAL EQUATIONS

1. Solve for x : $3x + 5x^{1/2} - 28 = 0$
2. Solve for x : $-2x^2 + 2x + 1 = 0$
3. Solve for x : $(x - 1)(x - 2) = 1$
4. Solve for x by completing the square: $4x^2 + 3x - 1 = 0$
5. Solve for x : $\sqrt{2x - 5} - \sqrt{x - 2} = 2$
6. Divide $x^3 - 10x + 3$ by $x + 3$
7. Verify that 2 is a root of the polynomial $6x^3 - 19x^2 + 9x + 10$ and factor this polynomial completely.
8. Find all values of a so that the polynomial $ax^2 + 5x + 2$ has two distinct real roots.
9. Solve for x : $x^2 + 2x - 3 > 0$
10. Graph the equation: $y = x^2 - 2x + 3$

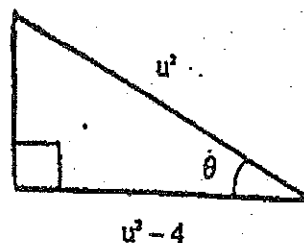
Topic V - FUNCTIONS

1. $f(u) = \frac{-3u^2 + 2u + 3}{au^2 + bu + 1}$. Find $f(0)$
2. $f(x) = -\frac{3}{x - 4}$. Find $f(\frac{1}{x + 2})$ and simplify.
3. $f(x) = 3x + 1$, $g(x) = x^2 - 1$. Find $f(g(x))$ and $g(f(x))$.
4. If $f(x) = \frac{2x + 1}{x - 1}$, for which x does $f(x) = -5$?

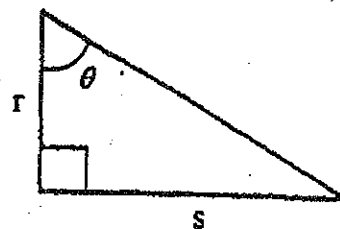
5. $f(t) = \frac{2t-1}{t+3}$. Find $\frac{5}{f(3)}$.
6. Graph the function $f(x) = \frac{1}{x-3}$
7. Graph the function $h(x) = |x^2 - 1|$
8. Find the domain and range of the function $g(x) = \sqrt{10+2x-x^2}$

Topic VI - TRIGONOMETRY

1. Given θ as shown in the figure to the right, find $\sin \theta$

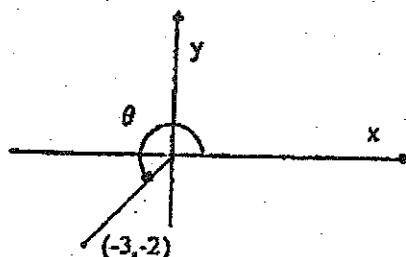


2. Given θ as shown in the figure to the right, find $\tan \theta \cos \theta$



3. Verify the identity: $\tan(\pi - x) = -\tan x$

4. Verify the identity: $\sec y - \cos y = \tan y \sin y$
5. Verify the identity: $\tan x + \tan y = \frac{\sin(x+y)}{\cos x \cos y}$
6. Find all x satisfying: $\tan^2 2x = 3, 0 \leq x \leq \pi$
7. Graph the equation: $y = \cos 3x$
8. Graph the equation: $y = 3 \sin \frac{x}{2}$
9. In the figure shown to the right find $\sec \theta$.



10. If $0 < \theta < 2\pi$ find all values of θ for which $2 \sin \theta = \tan \theta$
11. Express 108° in radians.
12. $\cos \frac{5\pi}{6} =$

Topic VII - LOGARITHMIC AND EXPONENTIAL FUNCTIONS

1. Solve for x : $\log_4 x = b$
2. Solve for u : $3^u = 4$
3. Evaluate $\log_{49} \sqrt{7}$
4. Evaluate $\log_4 \left(\frac{4^{-9}}{32} \right)$

5. Which of the following is larger? $5 - \log_2 60$, $3 - \log_2 20$
6. Simplify the following: $\log x^2 y - \frac{1}{2} \log x + 3 \log y$
7. Graph the equation: $y = \left(\frac{1}{2}\right)^x$
8. Graph the equation: $y = |\log_{10} x|$
9. Solve for x: $5^{3x} - 1 = 0$
10. Solve for x: $\log_{10}(3x + 1) = 3$

Topic VIII - WORD PROBLEMS

1. Sue is 2 years older than John. 15 years ago she was twice as old as he was. If x and y are the ages of Sue and John now, give a system of equations that could be solved to find x and y .
2. A 3x5 photograph is enlarged so that its width measures 7". What is the length of the enlargement?
3. If the circumference of a circle is multiplied by 5, how much is the area increased?
4. Two numbers add to 17, and 7 times the first minus five times the second is 3. What are the numbers?
5. A positive number is taken to the $1/3$ power and the result is squared. The final answer is 9. What is the original number?
6. The sine of twice an angle is $\frac{\sqrt{2}}{2}$. If the angle is between 0 and 2π what are its possible values?
7. The price of a plane ticket has been increased by 15% to \$172.50. What was the cost before the increase?
8. The radius of a circle is increased by 20%. What is the percent increase in area?

Solutions for Sample Test: Precalculus

Topic I - RATIONAL EXPRESSIONS

- | | | |
|-------------------------|--------------------------------------|-------------------------|
| 1. $x+1$ | 2. $\frac{-1}{x^2+2x}$ | 3. $\frac{-60u}{v}$ |
| 4. $\frac{x+3}{x(x-2)}$ | 5. $\frac{3a-2b}{(a-b)(a+2b)(a-3b)}$ | 6. $\frac{xy}{x^2-y^2}$ |
| 7. a^2b | 8. $\frac{x^2}{x-3}$ | |

Topic II - EXPONENTS AND RADICALS

- | | | |
|------------------------------|---------------------------|-------------------------------|
| 1. $\frac{1}{8}$ | 2. $5\sqrt{6}$ | 3. $(u+v)\sqrt{u-v}$ |
| 4. $2\sqrt{4x^2+9y^2}$ | 5. $20a^4b^2$ | 6. $\frac{y^5z}{x}$ |
| 7. x^{u^2-u} | 8. x^{a^2-1} | 9. $\frac{a(\sqrt[3]{2})}{2}$ |
| 10. $\frac{x^2y^{7/2}}{9^8}$ | 11. $\frac{y^{12}}{9x^8}$ | 12. $-a\sqrt{a}$ |
| 13. $x^{9/22}$ | 14. $2\sqrt{2}$ | |

Topic III - LINEAR EQUATIONS, INEQUALITIES AND ABSOLUTE VALUE

- | | | |
|----------------------------------|--|---------------------|
| 1. $\frac{2n}{n-m}$ | 2. $a=17$ | 3. $x=-\frac{2}{3}$ |
| 4. $x=1, y=-2$ | 5. $x=\frac{63}{19}, y=\frac{105}{19}$ | 6. 2 |
| 7. $\frac{1}{2}y-\frac{1}{3}x=1$ | 8. $-1\leq x\leq\frac{11}{3}$ | |

Topic IV - POLYNOMIALS AND POLYNOMIAL EQUATIONS

1. $x = \frac{49}{9}$

2. $x = \frac{1 \pm \sqrt{3}}{2}$

3. $x = \frac{3 \pm \sqrt{5}}{2}$

4. $x = -1, x = \frac{1}{4}$

5. $x = 27$

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

7. $(x-2)(2x+1)(3x-5)$

8. $a < \frac{25}{8}$

9. $x < -3$ or $x > 1$

10.



Topic V - FUNCTIONS

1. $f(0) = 3$

2. $\frac{3x+6}{4x+7}$

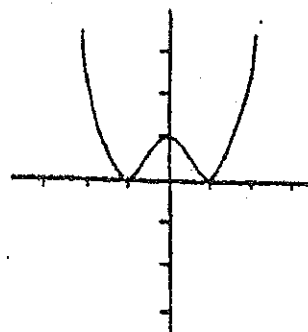
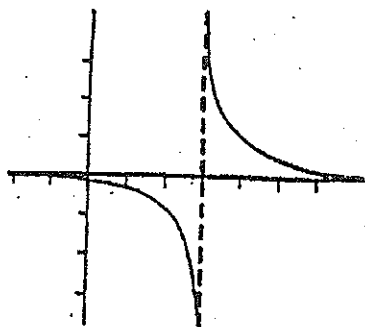
3. $f(g(x)) = 3x^2 - 2$
 $g(f(x)) = 9x^2 + 6x$

4. $x = \frac{4}{7}$

5. 6

6.

7.



8. Domain: $1 - \sqrt{11} \leq x \leq 1 + \sqrt{11}$ Range: $0 \leq y \leq \sqrt{11}$

Topic VI - TRIGONOMETRY

1. $\sin \theta = \frac{2\sqrt{2u^2 - 4}}{u^2}$

2. $\frac{s}{\sqrt{r^2 + s^2}}$

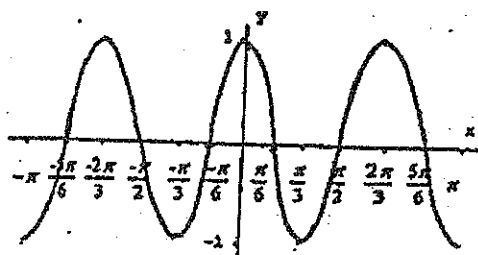
3. $\tan(\pi - x) = \frac{\sin(\pi - x)}{\cos(\pi - x)} = \frac{\sin x}{-\cos x} = -\tan x$

4. $\sec y - \cos y = \frac{1}{\cos y} - \cos y = \frac{1 - \cos^2 y}{\cos y} = \frac{\sin^2 y}{\cos y} = \tan y \sin y$

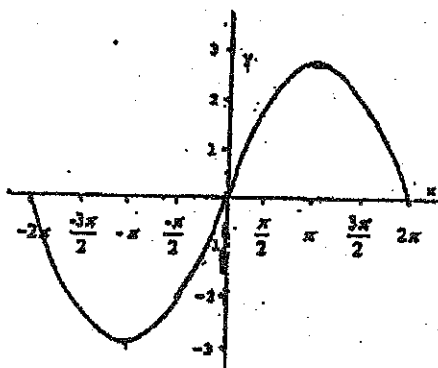
5. $\tan x + \tan y = \frac{\sin x}{\cos x} + \frac{\sin y}{\cos y} = \frac{\sin x \cos y + \sin y \cos x}{\cos x \cos y} = \frac{\sin(x + y)}{\cos x \cos y}$

6. $x = \frac{\pi}{6}, \frac{\pi}{3}, \frac{2\pi}{3}, \frac{5\pi}{6}$

7.



8.



9. $\sec \theta = -\frac{\sqrt{13}}{3}$

10. $\theta = \frac{\pi}{3}, \pi, \frac{5\pi}{3}$

11. $\frac{27\pi}{45}$

12. $-\frac{\sqrt{3}}{2}$

Topic VII - LOGARITHMIC AND EXPONENTIAL FUNCTIONS

1. $x = a^b$

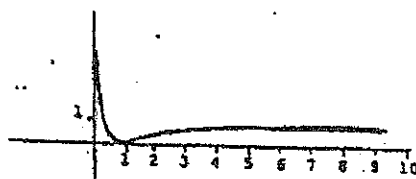
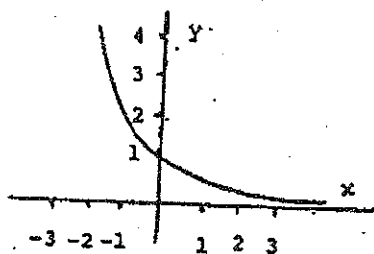
2. $u = \frac{\log 4}{\log 3} = 1.26$

3. $x = \frac{1}{4}$

4. $x = -\frac{23}{2}$

5. $5 - \log_2 60$

6. $\log(x^{3/2}y^4)$



7.

8.

9. $x = 0$

10. $x = 333$

Topic VIII - WORD PROBLEMS

1. $x = y + 2$

$x - 15 = 2(y - 15)$

2. $l = 11\frac{2}{3}$

3. 25 times

4. $7\frac{1}{3}, 9\frac{2}{3}$

5. 27

6. $\theta = \frac{\pi}{8}, \frac{3\pi}{8}, \frac{9\pi}{8}, \frac{11\pi}{8}$

7. \$150.00

8. 44%

