

Math 154 - College Algebra

Final Exam Review

The following equations may be useful on the review.

Exponential Growth Model: $y = ae^{bx}$, $b > 0$

Exponential Decay Model: $y = ae^{-bx}$, $b > 0$

Logistic growth Model $y = \frac{a}{1 + be^{-rx}}$

Logarithmic Models: $y = a + b \ln x$, or $y = a + b \log_{10} x$

$$\log_a x = \frac{\log_b x}{\log_b a}$$

$$\log_a a^x = x$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$V = \frac{4}{3} \pi r^3$$

$$A = Pe^{rt}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = \pi r^2$$

$$x^2 + y^2 = r^2$$

$$\frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

$$a^{\log_a x} = x$$

$$S = \left(\sum_{i=1}^n \Theta_i (n-2) - \pi \right) r^2$$

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$A = 4\pi r^2$$

$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$

$$i = \left(\frac{A}{P} \right)^{1/n} - 1$$

$$C = 2\pi r$$

$$(x - k)^2 + (y - k)^2 = r^2$$

Good Luck!

Simplify the following expression – Do not evaluate them! – Express all exponents as positive numbers.

1.) (3pt) $\sqrt{32x^2}$

2.) (3pt) $\left(\frac{2x}{5}\right)^2\left(\frac{2x}{5}\right)^{-4}$

3.) (3pt) $\frac{12a^3b^{-4}}{4a^{-2}b}$

4.) (4pt) Rationalize the denominator of the expression $\frac{2}{\sqrt[3]{5}}$

Perform the indicated operation and simplify.

5.) (4pt) $\frac{x^2+8x-20}{x^2+11x+10}$

6.) (4pt) $\frac{x+1}{x^2-3x-4}$

7.) (4pt) $6 - \frac{5}{x+3}$

8.) (4pt) $\frac{2}{x-2} - \frac{1}{x^2-3x+2}$

Where appropriate, perform the indicated operation and simplify.

9.) (4pt) $\frac{t^2-t-6}{t^2+6t+9} \cdot \frac{t+3}{t^2-4}$

10.) (4pt) $\left[\frac{\left(\frac{x^2-1}{x}\right)}{\frac{(x-1)^2}{x}} \right]$

11.) (4pt) $\frac{x+13}{x^2(3-x)} \cdot \frac{x(x-3)}{5}$

12.) (4pt) $\frac{4y-16}{5y+15} \div \frac{4-y}{2y+6}$

Use the quadratic formula to find solutions to the following quadratic equations;

13.) (3 pts) $18x^2 - 24x + 8 = 0$

14.) A stone is thrown vertically upward at a velocity of 20 feet per second. The height h (in feet) of the stone at time t (in seconds) after it is thrown is

$$h = -16t^2 + 20t + 40$$

a.) (4 pts) Find the time it takes for the stone to reach a height 31 feet. Round your answer to two decimal places.

b.) (1 pt) Write your answer in a well-constructed sentence.

15.) (3 pts) Write the standard form of the equation of the circle with the given characteristics:

Center (3,-2), Solution (point on circumference): (-1,1)

16.) Find the radius and center of the circle whose equation is $(x-1)^2 + (y+3)^2 = 9$.

a.) (2 pts) The center is: _____

b.) (2 pts) The radius is: _____

17.) The graph of the function $f(x) = \frac{1}{(x-2)^3}$ is shown below:

a.) (3 pts) What is the range of this function?

b.) (3 pts) What is the domain of this function?

18.) (3 pts) Find the vertical asymptote(s) of the function, $f(x) = \frac{2x^2}{x+1}$. If the function has no vertical asymptote state "No Asymptote".

19.) (3 pts) Find the vertical asymptote(s) of the function, $f(x) = \frac{2x}{4}$. If the function has no vertical asymptote state "No Asymptote".

Given: $f(x) = 3x + 1$ and $g(x) = 5x - 4$

20.) (3 pts) Find $(fg)(2)$

23.) (3 pts) Find $\left(\frac{g}{f}\right)(x)$

Given: $f(x) = x^2 + 3$ and $g(x) = \sqrt{1-x}$

21.) (3 pts) Find $(f \circ g)(x)$ or $f(g(x))$

Given: $f(x) = x^{2/3}$, and $g(x) = x^6$

22.) (3 pts) Find $g \circ f$ or $g(f(x))$

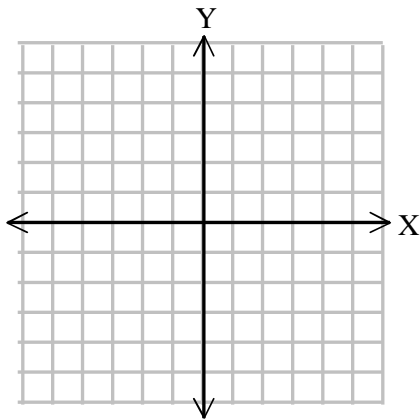
The weekly cost of producing x units in a manufacturing process is given by $C(x) = 60x + 750$. The number of units " x " produced in t hours is given by $x(t) = 50t$.

23.) (3 pts) Find $(C \circ x)(t)$ can also be written $C(x(t))$

24.) (2 pts) Interpret your answer - i.e. what does $(C \circ x)(t)$ mean?

The following is a graph of the function $f(x) = x^3$.

25.) (2 pts) Using the graph of $f(x)$ as a guide, sketch the graph of $f(x) = x^3 + 2$



26.) (3 pts) Write an equation for the function that is the shape of $f(x) = x^2$ but shifted to the right three units and seven units downward.

27.) (3 pts) Write an equation for the function that is the shape of $f(x) = x^2$ and is reflected about the x-axis.

28.) (3 pts) Find the inverse of the function $f(x) = x^3 + 1$

29.) (3 pts) Find the inverse of the function $y = -\frac{2x+6}{7}$

For the function $f(x) = \frac{x^2}{x^2 - 9}$

30.) (3 pts) State the domain:

31.) (3 pts) Identify all intercepts

32.) (3 pts) Find any vertical asymptotes, if there are no vertical asymptotes state "None"

33.) (3 pts) Find any horizontal asymptotes, if there are not horizontal asymptotes state "None"

34.) (3 pts) Rewrite the expression $\text{Log}_7 343 = 3$ in exponential form

35.) (3 pts) Rewrite the expression $4^{-4} = \frac{1}{64}$ in logarithmic form

36.) (3 pts) Evaluate $\log_7 4$ using the change-of-base formula. Round your answer to three places

37.) (6 pts) A deposit of \$7,500 is placed in a savings account at an interest rate of 5% compounded continuously. Assuming no more deposits or withdrawals are made to the account, how long will it take for the account balance to reach \$10,000?

a.) (2pt) Write an equation to solve the problem.

b.) (3pt) Solve the equation. Be sure to show your algebra.

c.) (2pt) Write your answer in a well-structured sentence with the units correctly stated.

Condense the following expressions to a logarithm of a single quantity.

Be able to simplify if possible.

38.) (3 pts) $2\ln 8 + \ln(z - 4)$

Use the properties of logarithms to expand the expression as a sum, difference and/or constant multiple of logarithms.

39.) (3 pts) $\log_{10} \frac{x^2 y}{z}$

Solve the following exponential and logarithmic equations algebraically. Approximate the results to three decimal places

40.) (4 pts) $4e^x = 91$

41.) (4 pts) $\log 3z = 2$

42.) (4 pts) $5^{-t/2} = 0.20$

43.) (4 pts) $2 + 3\ln x = 12$