Exam 3 is this Friday, April 17, 2020 !

Disclaimer : while this week-in-review includes some Exam 3 review, **not everything is covered on this week-in-review**. Use the set of review questions in eCampus for a comprehensive review for all of Chapter 5. Also use previous Week-in-Review worksheets for more practice.

Work-out Problems

Study tip : Show <u>all</u> your work !

Exercise 1. Consider the exponential function $f(x) = -7e^{4x}$. Find the domain, range, end behavior, horizontal asymptote, zeros, and y-intercept.

Exercise 2. Solve the following equations for the exact value(s) of x.

1. $e^{2x-5} = e^3 \cdot e^4$
2. $\dfrac{8^{-3}}{8^{-2x}} = \left(\dfrac{1}{4^2}\right)^x \cdot 16^2$
3. $2^x \cdot x^2 - 5 \cdot 2^x \cdot x = 14 \cdot 2^x$
4. $5^x = 3^{1-2x}$
5. $\log_3(81) - 11^{\log_{11}(5)} + \log_4(4^x) = 4^{3/2}$
6. $\log_c(3x-1) = 3$, where $c > 0$
7. $\ln(x+1) = -\ln(x) + \ln(6)$

Exercise 3. Let $f(x) = \frac{1}{4}e^{3x-7}$ and $g(x) = \sqrt{\log_2(x) - 1}$, and $h(x)$ have values in the table given below

x	-3	-2	-1	0	1	2	3	4	5	6
$h(x)$	0	5	0	-15	6	3	5	1	39	4

Find each of the following.

1. $(g + h)(-3)$
2. $(fg)(\sqrt{3})$
3. $(f - g)(4)$
4. $\left(\dfrac{f}{g}\right)(0)$
5. $(f \circ g)(x)$
6. $(h \circ h)(6)$
7. $(f \circ h)(3)$

Exercise 4. Express the domain of the given function in interval notation.

1. $f(x) = e^{\sqrt[4]{3x-27}}$
2. $g(t) = \dfrac{8 \cdot 4^t}{3t(2-t)^{\frac{1}{8}}}$
3. $h(s) = \dfrac{55s + 78}{e^{12s-22}}$

4. $j(t) = \log_8(12 - 4t)$
5. $h(x) = \dfrac{\ln(x+15)}{\sqrt[7]{x+3}}$

Exercise 5. *Aggie Venture Associates* is encouraging you to deposit money into their account with an interest rate of 3.5% that compounds quarterly. How long would it take to increase your principal to 23 times your initial investment ? Round your final answer to two decimal places, if necessary.

   Reliance Reveille offers you an interest rate of 4% compounded continuously. How much would you have to invest in the account today to have a balance of \$230,000 after 40 years ? Round your final answer to two decimal places.

Exercise 6. Let $f(x) = \sqrt[3]{-x + \frac{3}{2}}$ and $g(x) = x^2 - 4$. Write down the formula of $(f \circ g)(x)$.

Exercise 7. Find two functions f and g such that $(f \circ g)(x) = \dfrac{1}{\sqrt{7 - 2x^2}}$ and neither $f(x) = x$ nor $g(x) = x$. No explanation necessary.

Exercise 8.
1. Describe in words the transformations necessary to go from the graph of a parent function $f(x)$ to the graph of $g(x)$, where $g(x) = -f(x-4) + 1$.
2. The graph of $f(x)$ is given below. <u>On the same plane below</u>, sketch the graph of the following transformation : $g(x) = -f(x-4) + 1$. Indicate clearly at least 6 points on the graph of $g(x)$.
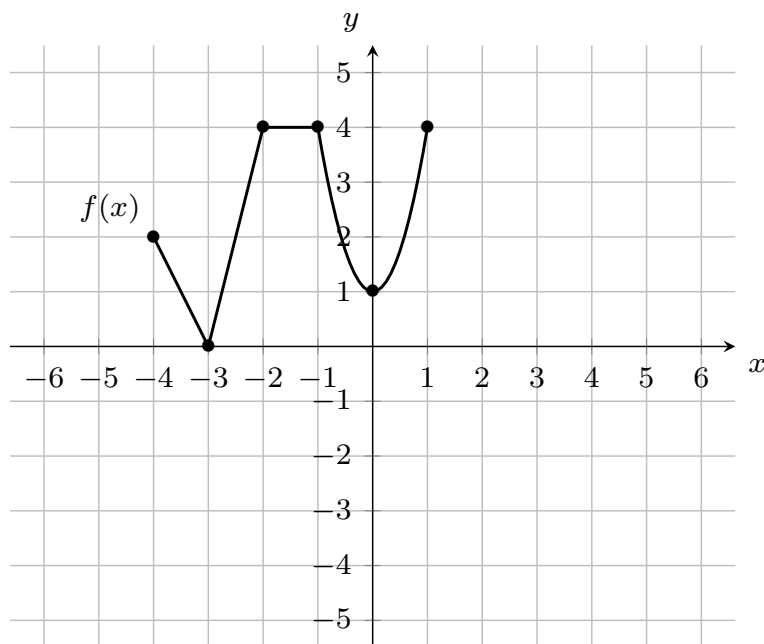
Exercise 9. Use the graphs of the following parent functions to determine which are one-to-one functions : (1) exponential growth, (2) logarithmic decay, (3) quadratic, (4) absolute value.

Exercise 10. Expand or condense the following using properties of logarithms and simplify. Assume when necessary that all quantities represent positive numbers.

1. $\log\left(\dfrac{x^3\sqrt{x+1}}{10^5(x-2)^2}\right)$

2. $\frac{1}{3}\log_b(z) - 4\log_b(z^2) + \log_b(x) + \dfrac{\log_b(y+9)}{2}$

Multiple Choice Problems

Study tip : Write out <u>all</u> your work when you complete the multiple-choice problems.

Multiple Choice 1. Suppose $b > 0$ and $c < 0$. Which of the following is NOT a transformation that can be used to graph the function $g(x) = -8\sqrt[5]{x-b}+c$ from corresponding parent function ?

(a) Vertical shift down c units

(b) Vertical stretch by a factor of 8

(c) Reflection over the x-axis

(d) Horizontal shift right b units

(e) All of these transformations are needed.

Multiple Choice 2. The expression $\dfrac{2e^{x+4}}{4^{x+2}e^{2x-7}}$ is equivalent to which of the following ?

(a) $2^{-2x-3}e^{-x+11}$

(b) $4^{-x}e^{-x+11}$

(c) $2^{-2x-4}e^{-x+11}$

(d) $2^{-2x+5}e^{-x-3}$

(e) $2^{5-2x}e^{-x+11}$

Multiple Choice 3. Given $g(x) = -x^2+3x-4$, find and simplify $\dfrac{g(x+h)-g(x)}{h}$ completely.

(a) $\dfrac{2x^3+2xh+h^2+3h}{h}$

(b) 1

(c) $3-h+2x$

(d) $-2x-h+3$

(e) None of these

Multiple Choice 4. What amount will an account have after 10 years if \$3,000 is invested at an annual rate of 3.15% compounded continuously ? (Round to the nearest penny.)

(a) \$7,110.78

(b) \$4,109.08

(c) \$70,008.19

(d) \$4,110.78

(e) None of the above

Multiple Choice 5. If $f(x) = \sqrt[3]{2x+1}$ and $h(x) = x + 3$, find $(h \circ f)(13)$.

(a) 48

(b) 3

(c) $\sqrt[3]{33}$

(d) 16

(e) 6

Multiple Choice 6. Which of the following are properties of the graph of $g(x) = \ln x$?

A : The graph has a vertical asymptote at $x = 1$.

B : The graph has a vertical asymptote at $x = 0$.

C : The graph goes through $(e, 0)$.

D : The graph goes through $(1, 0)$.

E : The graph has a horizontal asymptote.

F : $g(x) \to \infty$ as $x \to \infty$.

(a) A, C, and E

(b) B, D, and E

(c) A, D, and E

(d) B, D, and F

(e) A, C, and F

Multiple Choice 7. If $\ln 2 = a$ and $\ln 3 = b$, then $\ln \sqrt[5]{6} =$

(a) $\frac{1}{5}ab$

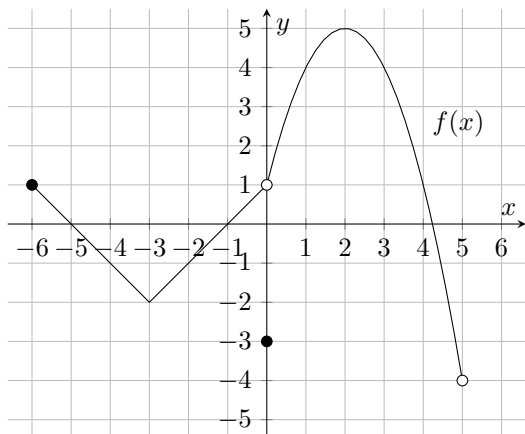(b) $\frac{1}{5}(a + b)$

(c) $5ab$

(d) $5(a + b)$

(e) None of these

Multiple Choice 8. The equation $\log_\pi x = \frac{1}{2}$ can be written in exponential form as

(a) $x = \left(\frac{1}{2}\right)^\pi$

(b) $x = \pi^{1/2}$

(c) $x^\pi = 1/2$

(d) $\pi = x^{1/2}$

(e) $\pi = \left(\frac{1}{2}\right)^x$

Multiple Choice 9. Determine the domain of the following function. $f(x) = \dfrac{\sqrt[3]{x-3}}{x^2-7x+12}$.

(a) $(3, 4) \cup (4, \infty)$

(b) $[3, 4) \cup (4, \infty)$

(c) $(-\infty, 4) \cup (4, \infty)$

(d) $(-\infty, 3) \cup (3, 4) \cup (4, \infty)$

(e) None of these

For Multiple Choice 10, 11, and 12, use the graph of $f(x)$ below.

Multiple Choice 10. Which of the following statements is **FALSE**?

(a) f is not one-to-one.

(b) f is a function.

(c) $f(1) = 4$.

(d) $f(0)$ does not exist.

(e) $f(-5) = 0$.

Multiple Choice 11. What is the domain of f?

(a) $[-6, 5)$

(b) $[-6, 1) \cup (1, 5)$

(c) $(-\infty, \infty)$

(d) $(-4, 5]$

(e) None of these answer choices are correct.

Multiple Choice 12. Suppose $g(x) = |x - 7|$. What is $f(g(3))$?

(a) None of these answer choices are correct.

(b) $f(g(3)) = 1$.

(c) $f(g(3)) = 0$.

(d) $f(g(3)) = 4$.

(e) $f(g(3)) = 3$.

Multiple Choice 13. The cost, in dollars, of manufacturing x units of a product is given by $C(x) = 4x + 15000$. The demand equation for the same product is given by $p = -\frac{1}{500}x + 22$ where x is the quantity demanded at a unit price of $\$p$. If the selling price of the item is determined by the demand function, what is the maximum profit that this manufacturer can obtain?

(a) \$15,000

(b) \$25,500

(c) \$25,000

(d) \$30,000

(e) None of these

Multiple Choice 14. Let h be the function $h(x) = -(39630\sqrt{3} + 118560)x^2 + (30\sqrt{3} - 3975)x^4 + (3975\sqrt{3} + 39630)x^3 - 30x^5 + (118560\sqrt{3} + 102240)x - 102240\sqrt{3}$ which factors into :

$$h(x) = -15(x - \sqrt{3})(x + 142)(2x - 3)(x - 4)^2.$$

Which of the following statements is **FALSE**?

(a) h has a y-intercept of $(0, -102240\sqrt{3})$.

(b) The leading coefficient of h is -30.

(c) $h(x) \to \infty$ as $x \to -\infty$.

(d) h has a zero at $(-142, 0)$.

(e) The domain of h is $(-\infty, -142) \cup (-142, \frac{3}{2}) \cup (\frac{3}{2}, \sqrt{3}) \cup (\sqrt{3}, 4) \cup (4, \infty)$.