Name : _____

TO RECEIVE FULL CREDIT YOU MUST SHOW YOUR WORK. No notes or books are allowed.

No. 1. (10 points) State whether each statement is **True** or **False** as stated. Provide a clear reason for your answer.

i) The domain of the composite function $(f \circ g)(x)$ is the same as the domain of $g(x)$.

ii) If f and g are inverse functions, then their graphs are symmetric with respect to the line $y = x$.

iii) The range of the exponential function $f(x) = a^x,\quad a > 0, a \neq 1$, is the set of all real numbers.

iv) If $y = \log_a x$, then $y = a^x$.

v) The graph of $f(x) = \log_a x,\quad a > 0, a \neq 1$, has an x-intercept equal to 1 an no y-intercept.

No. 2. (10 points) Between 9:00 pm and 10:00 pm cars arrive at Burger King's drive-thru at the rate of 12 cars per hour (0.2 car per minute). The following formula from statistics can be used to determine the probability that a car will arrive within t minutes of 9:00 pm.

$$F(t) = 1 - e^{-0.2t}$$

a) Determine the probability that a car will arrive within 5 minutes of 9 pm (that is before 9:05 pm).

b) Determine the probability that a car will arrive within 30 minutes of 9 pm (before 9:30 pm).

c) What value does F approach as t becomes unbounded in the positive direction?

No. 3. (12 Points) Evaluate each expression using the values given in the table

x	-3	-2	-1	0	1	2	3
f(x)	11	9	7	5	3	1	-1
g(x)	-8	-3	0	1	0	-3	-8

a) $(f \circ g)(2) =$

b) $(g \circ f)(2) =$

c) $(g \circ g)(2) =$

d) $(f \circ f)(2) =$

No. 4. (7 points) Find the domain of the composite function $f \circ g$ given that $f(x) = \dfrac{x}{x+3}$ and $g(x) = \dfrac{2}{x}$.

No. 5. (6 points) Given that $f(x) = x + 1$ and $g(x) = x^2 + 4$, find

i) $(f \circ g)(x)$

ii) $(g \circ f)(x)$

No. 6. (6 Points) Find the domain of

$$g(x) = \ln(x - 1).$$

No. 7. (7 points) The graph of a one-to-one function f is given (Figure 1). Draw the graph of the inverse function f^{-1} on the same figure.
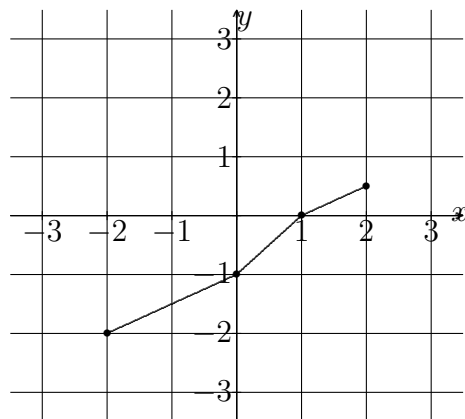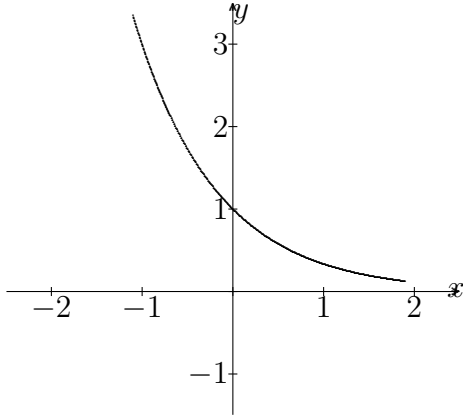

Figure 1:

No. 8. (10 points) Given that the function $f(x) = \dfrac{4}{x + 2}$ is one-to-one.

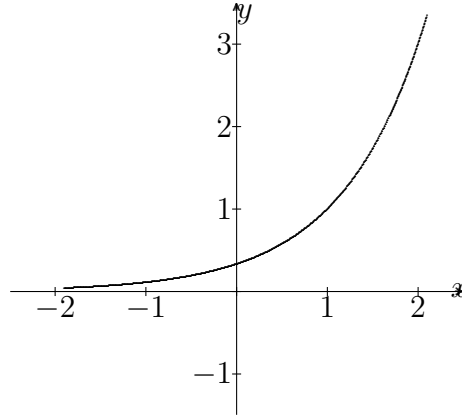a) Find the inverse of f.

b) What is the domain of f.

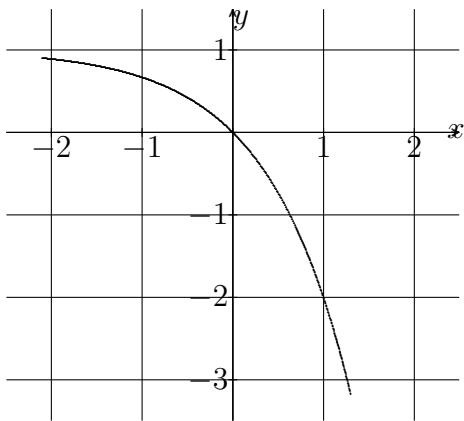c) What is the range of f.

No. 9. (12 points) The graphs given in Figure 2 represent exponential functions. Match each graph to one of the functions and note that $a > 1$.
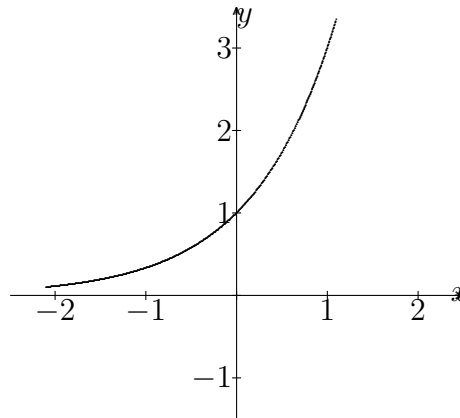
(A)

(B)

(C)

(D)

Figure 2:

$y = 1 - a^x$ $-\,-\,-\,-$ $y = a^x$ $-\,-\,-\,-$ $y = a^{x-1}$ $-\,-\,-\,-$ $y = a^{-x}$ $-\,-\,-\,-$

No. 10. (10 points) Verify that the functions f and g are inverses of each other, where

$$f(x) = 4x - 8 \qquad \text{and} \qquad g(x) = \frac{x}{4} + 2.$$

No. 11. (10 points) Solve the equations

i) $4^{x^2} = 2^x$

ii) $\log_3(3x - 2) = 2$