Name: _____

## Multiple Choice

**Directions:** Read all questions carefully. In this section, you do not need to show your work. Mark the box that corresponds to the *best* answer. Unless otherwise directed, mark one box only. If you would like to change your answer, completely erase your old answer.

(3$^{\text{pts}}$)    **1.** The amount of water $W$ (in thousands of gallons) in a pool is a function of time $t$ (in days) since it was filled. Translate the statement $W(15) = 12$ into English.

☐ For every 15 days, the pool looses 12 gallons of water.

☐ When the pool has 15,000 gallons of water, it has been 12 days since it was filled.

☐ For every 12 days, the pool gains 15 gallons of water.

☐ When the pool has 12,000 gallons of water, it has been 15 days since it was filled.

☐ After 12 days, the pool contains 15 thousand gallons of water.

☐ After 15 days, the pool contains 12 thousand gallons of water.

(2$^{\text{pts}}_{\text{ea.}}$)    **2.** Graphs of $f(x)$ and $g(x)$ appear below.
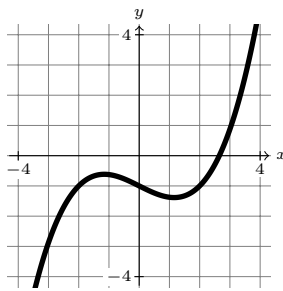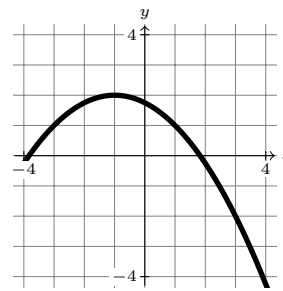


$f(x)$                $g(x)$

(a) Find $g(-3)$.

☐ -2      ☐ 3.5      ☐ 4      ☐ -4      ☐ -3

☐ 3      ☐ -1      ☐ 0      ☐ 1      ☐ 2

(b) Find $f(g(3))$.

☐ -4      ☐ 1      ☐ -1      ☐ 3      ☐ -3

☐ 2      ☐ 4      ☐ -2      ☐ -0.5      ☐ 0

(c) Find $g(f(3))$.

☐ -2      ☐ 2      ☐ 3      ☐ 0      ☐ -1

☐ -3      ☐ 1      ☐ -0.5      ☐ 4      ☐ -4

(d) Find the average rate of change in $f(x)$ between $x = -2$ and $x = 3$.

☐ -0.4      ☐ 1      ☐ 2.5      ☐ 0      ☐ 2

☐ 0.4      ☐ -1.6      ☐ 1.6      ☐ -2.5      ☐ -1

(e) Find all value(s) of $x$ such that $f(x) = -1$. *Mark all that apply.*

☐ 2      ☐ -0.5      ☐ -3      ☐ 3      ☐ -4

☐ -2      ☐ -1      ☐ 0      ☐ 4      ☐ 1

(5$^{\text{pts}}$)   **3.** At the end of summer, a tree has 4,600 leaves. After 2 weeks, the tree has 4,100 leaves. Find the relative rate of change in the number of leaves.

☐ -250 leaves per week     ☐ -12.19%           ☐ 250 leaves per week

☐ 12.19%                 ☐ -10.87%           ☐ 10.87%

(2$^{\text{pts}}_{\text{ea.}}$)   **4.** Decide whether the following tables might represent linear functions, exponential functions, or neither.

| $x$ | $f(x)$ | | $x$ | $g(x)$ | | $x$ | $h(x)$ | | $x$ | $r(x)$ | | $x$ | $s(x)$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 3 | | 0 | 83 | | 0 | 1.4582 | | 0 | 3 | | 0 | 12 |
| 1 | 5 | | 1 | 66 | | 1 | 1.1666 | | 1 | 9 | | 1 | 12 |
| 2 | 10 | | 2 | 49 | | 2 | 0.9332 | | 2 | 27 | | 2 | 12 |
| 3 | 9 | | 3 | 32 | | 3 | 0.7466 | | 3 | 81 | | 3 | 12 |
| 4 | 14 | | 4 | 15 | | 4 | 0.5973 | | 4 | 243 | | 4 | 12 |

(a) Which table(s) might represent linear functions? *Mark all that apply.*

☐ $f(x)$        ☐ $s(x)$        ☐ $g(x)$        ☐ $h(x)$        ☐ $r(x)$

(b) Which table(s) might represent exponential functions? *Mark all that apply.*

☐ $g(x)$        ☐ $s(x)$        ☐ $f(x)$        ☐ $h(x)$        ☐ $r(x)$

(c) Which table(s) represent neither? *Mark all that apply.*

☐ $s(x)$        ☐ $g(x)$        ☐ $r(x)$        ☐ $h(x)$        ☐ $f(x)$

(5$^{\text{pts}}$)   **5.** A radioactive substance with a half-life of 18 days is accidentally spilled in a laboratory. Safety regulations forbid anyone from entering the laboratory until at most 2.5% of the original amount spilled remains. How many days must pass before people be able to return to the laboratory?

☐ 133.6 days     ☐ 129.2 days     ☐ 720.0 days     ☐ 95.8 days     ☐ 101.59 days

☐ Infinitely many ☐ 59.8 days      ☐ 56.4 days      ☐ 18.0 days     ☐ None of these

(3$^{\text{pts}}_{\text{ea.}}$)   **6.** You own a small business that has just negotiated a new contract. The contract calls for your company to receive an immediate payment of \$40,000, a payment of \$45,000 after 1 year, a payment of \$50,000 after 2 years, and a payment of \$55,000 after 3 years. Assume that invested cash earns interest at a rate of 3.2%, compounded continuously.

(a) Find the future value (in 3 years time) of the 4 payments made to your company.

☐ \$190,280     ☐ \$198,970     ☐ \$199,020     ☐ \$190,610     ☐ \$190,000

☐ \$198,490     ☐ \$190,390     ☐ \$198,630     ☐ \$0           ☐ None of these

(b) Find the present value of these payments.

☐ \$0         ☐ \$181,448     ☐ \$190,000     ☐ \$190,391     ☐ \$181,212

☐ \$40,000     ☐ \$180,449     ☐ \$180,876     ☐ \$180,593     ☐ None of these

(5$^{\text{pts}}$)   **7.** Which discrete interest rate is equivalent to a continuous interest rate of 7.41%?

☐ 7.58%        ☐ 7.63%        ☐ 7.46%        ☐ 7.69%

☐ 7.24%        ☐ 7.41%        ☐ 7.15%        ☐ 7.55%

$(3^{\text{pts}}_{\text{ea.}})$    **8.** The following is a graph of the function $f(x)$. Some points are labeled.
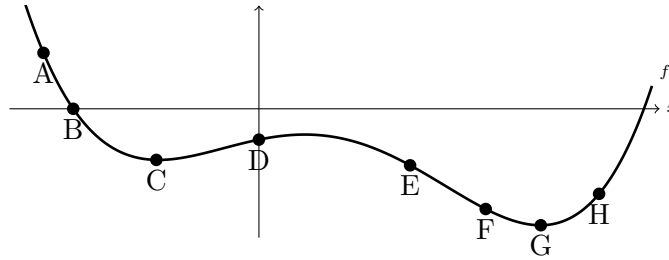


(a) At which of the labeled points is the derivative of $f$ zero? *Mark all that apply.*

☐ A     ☐ F     ☐ H     ☐ B     ☐ E     ☐ G     ☐ D     ☐ C

(b) At which of the labeled points is the derivative of $f$ negative? *Mark all that apply.*

☐ D     ☐ B     ☐ F     ☐ G     ☐ E     ☐ A     ☐ C     ☐ H

(c) At which of the labeled points is the derivative of $f$ positive? *Mark all that apply.*

☐ D     ☐ A     ☐ B     ☐ C     ☐ E     ☐ G     ☐ H     ☐ F

(d) At which of the labeled points is the derivative of $f$ most negative?

☐ B     ☐ H     ☐ C     ☐ E     ☐ F     ☐ D     ☐ G     ☐ A

## Free Response

**Directions:** Show all work. No credit for answers without work.

$(2^{\text{pts}}_{\text{ea.}})$    **9.** Sketch graphs of functions with the following properties.

(a) Increasing and concave up.

(c) Decreasing and concave up.

(b) Increasing and concave down.

(d) Decreasing and concave down.

$(6^{\text{pts}}_{\text{ea.}})$ **10.** Find formulas for the following functions.

(a) The linear function through $(-2, 6)$ and $(3, 1)$.

(b) The exponential function through $(-2, 6)$ and $(3, 1)$.

$(3^{\text{pts}}_{\text{ea.}})$ **11.** The quantity $q$ (in millions of boxes) of corn flake cereal demanded by the market when the price of a box is $p$ dollars is given by the equation $q = 44 - 5p$.

(a) Find the $p$-intercept and $q$-intercept and interpret them in terms of consumer demand.

(b) The supply curve is given by $q = p^2 + 2p$, where $q$ (in millions of boxes) is the quantity of corn flakes produced when the price of a box is $p$ dollars. Find the equilibrium price and quantity sold.

$(4^{\text{pts}}_{\text{ea.}})$    **12.** Solve the following equations for $x$ <u>exactly</u>. Decimal approximations are worth partial credit.

(a) $3e^{2x} = 4$

(c) $4\ln(7x + 6) = 12$

(b) $5e^{6x+1} = 2^{2x}$

(d) $8e^{-x+2} = \ln(3)$