

Name:

Score:

Show work in numbers 2-12 to earn full credit.

1. (18 points) Match each function with one of the graphs labeled A to E.

(a)  $f(x) = -\ln(-x)$

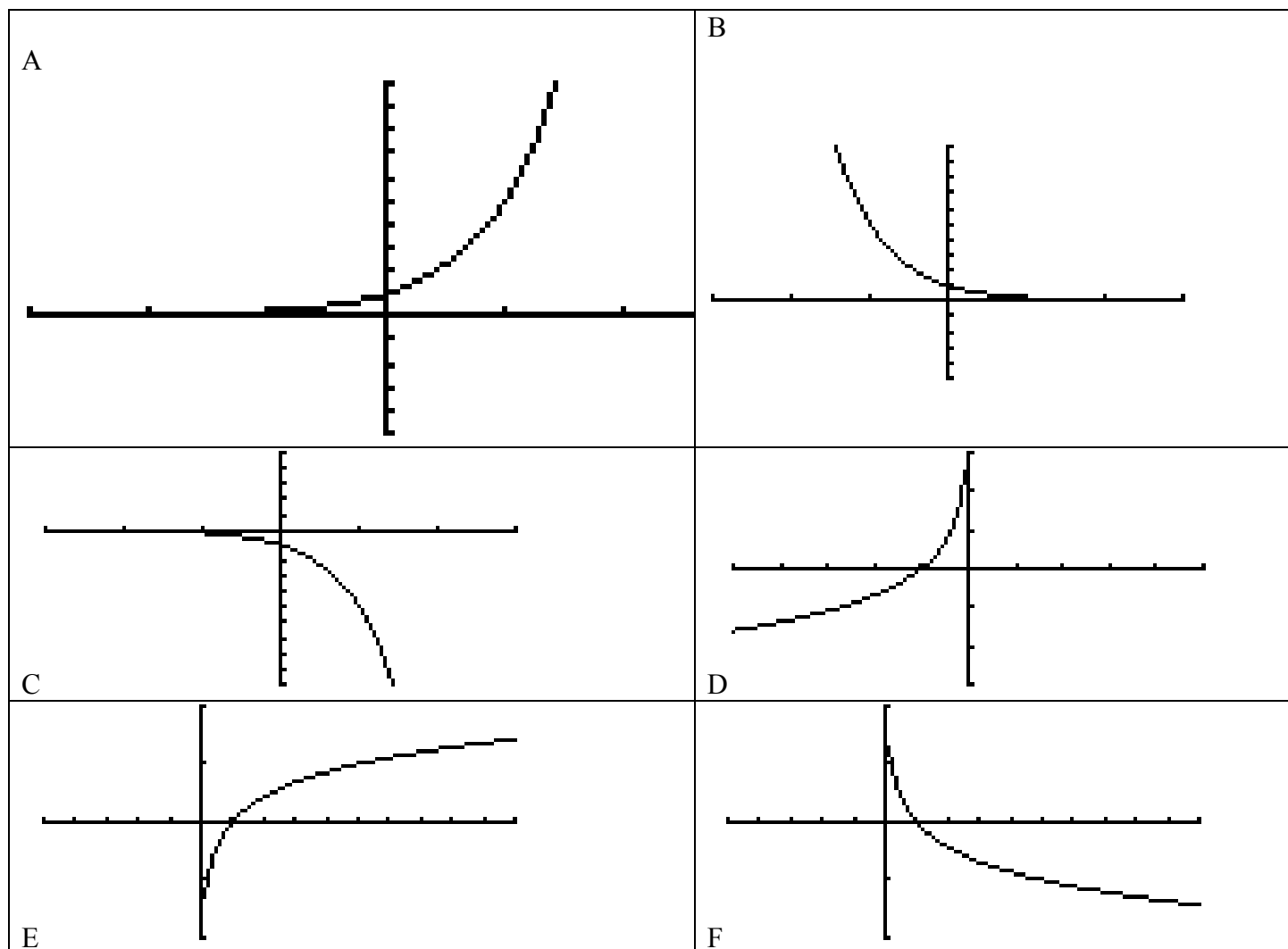
(b)  $f(x) = \log_5 x$

(c)  $f(x) = -\log_5 x$

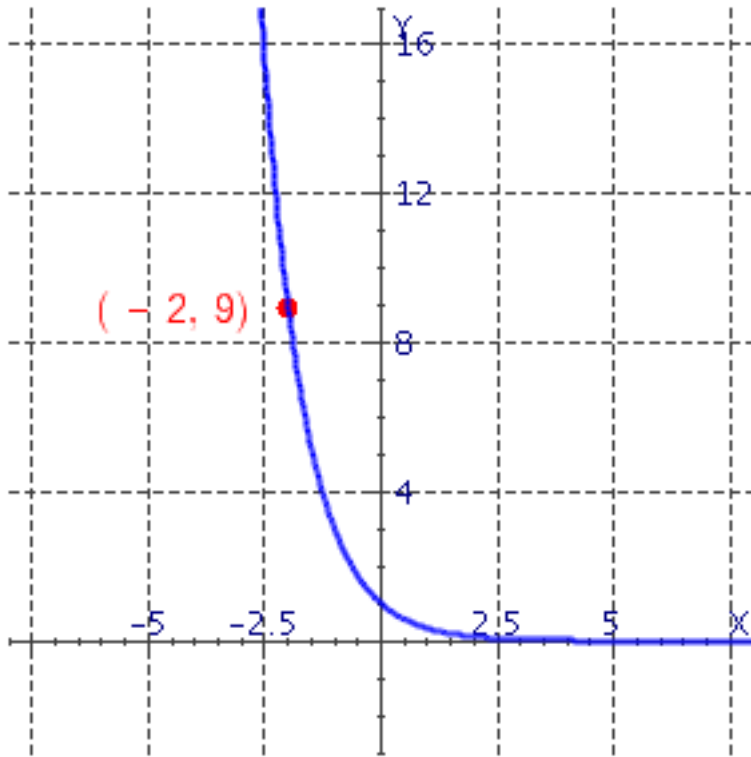
(d)  $f(x) = 5^x$

(e)  $f(x) = -5^x$

(f)  $f(x) = 5^{-x}$



2. (10 points) Find the exponential function  $f(x) = a^x$  whose graph is given.



3. (5points) State the horizontal asymptote of (a) and the vertical asymptote of (b).

(a)  $f(x) = 5^{x+1} - 4$

(b)  $f(x) = \ln(2-x)$

4. (10 points) Use the definition of the logarithmic function to find x:

(a)  $\log_3 243 = x$

(b)  $\log_3 x = 3$

5. (10 points) Find the domain of the function.

$g(x) = \log_3(x^2 - 1)$

6. (5 points) Use the Laws of Logarithms to rewrite the expression in the form with no logarithm of a product, quotient, root, or power.

$$\log\left(\frac{x^3 y^4}{z^6}\right)$$

7. (5 points) Rewrite the expression as a single logarithm.

$$4\log x - \frac{1}{3}\log(x^2 + 1) + 2\log(x - 1)$$

8. (8 points) Solve the equation.

$$e^{4x} + 4e^{2x} - 21 = 0$$

9. (8 points) Solve the logarithmic equation for x.

$$\log_9(x - 5) + \log_9(x + 3) = 1$$

10. (8 points) How long will it take for an investment of \$1000 to double in value if the interest rate is 8.5% per year, compounded continuously?

11. (8 points) Use a graphing calculator to find all solutions of the equation, correct to two decimal places.

$$x^3 - x = \log(x + 1)$$

12. (8 points) The number of bacteria in a culture is modeled by the function

$$n(t) = 500e^{0.45t}$$

(a) How many bacteria are in the culture after 3 hours?

(b) After how many hours will the number of bacteria reach 10,000?

**Bonus**

(7 points) The half-life of strontium-90 is 28 years. How long will it take a 50-mg sample to decay to a mass of 32 mg?