Math 143: College Algebra Name: _____

Sample Final Exam Instructor: _____

Fall 2007 Section: _____

You are allowed to use a couple of 3×5 cards of notes. Calculators are allowed.

Part I consists of 10 multiple choice questions worth 5 points each. Record your answers by placing an X through one letter for each problem on this answer sheet.

Part II consists of 10 partial credit problems worth a total of 100 points. Show **all** your work on the page on which the question appears.

Do **not** remove this answer page – you need to return the whole exam. You are allowed two hours to do the exam. You may leave earlier if you are finished.

Answer Sheet

1. [a] [b] [c] [d] [e]
2. [a] [b] [c] [d] [e]
3. [a] [b] [c] [d] [e]
4. [a] [b] [c] [d] [e]
5. [a] [b] [c] [d] [e]
6. [a] [b] [c] [d] [e]
7. [a] [b] [c] [d] [e]
8. [a] [b] [c] [d] [e]
9. [a] [b] [c] [d] [e]
10. [a] [b] [c] [d] [e]

For Grading Use Only

1–10	11	12	13	14	15

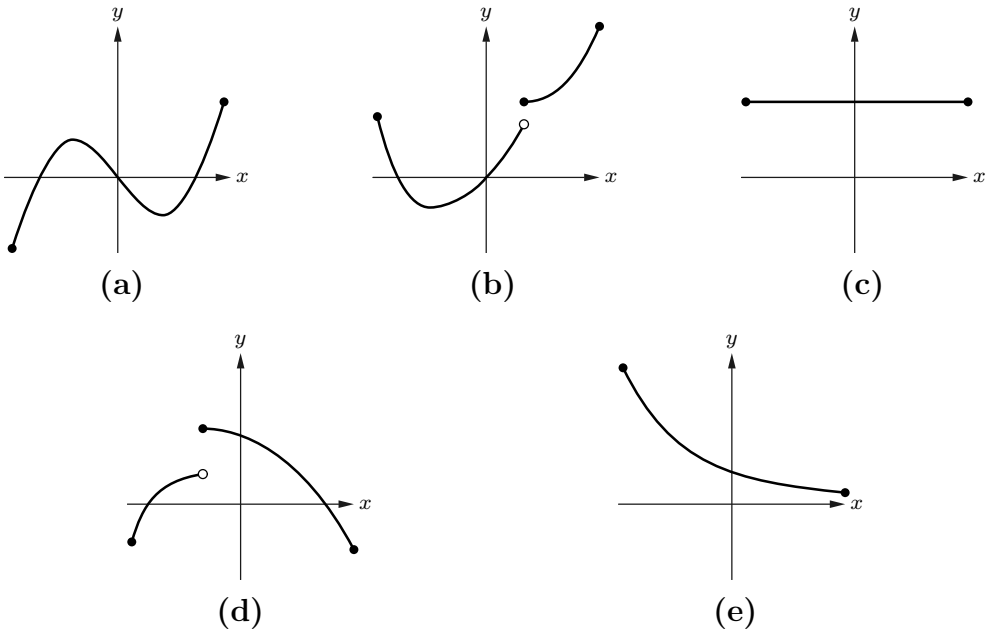
16	17	18	19	20	Total

Part I: Multiple Choice Questions

1 (5 points). Find the domain of the function $y = \dfrac{1}{\sqrt{x^2-1}}$.

(a) $(-\infty, -1] \cup [1, \infty)$
(b) $[-1, 1]$
(c) $(-\infty, -1) \cup (1, \infty)$
(d) $(-1, 1)$
(e) $(1, \infty)$

2 (5 points). Determine which graph represents a one-to-one function.



3 (5 points). Find the inverse function of $f(x) = \dfrac{2x-1}{x-3}$.

(a) $f^{-1}(x) = \dfrac{x-3}{2x-1}$
(b) $f^{-1}(x) = \dfrac{1-2x}{x-3}$
(c) $f^{-1}(x) = \dfrac{2x+1}{x+3}$
(d) $f^{-1}(x) = \dfrac{3x-1}{x-2}$
(e) $f^{-1}(x) = \dfrac{x-2}{3x-1}$

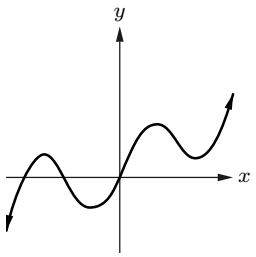
4 (5 points). Suppose that the height of an object shot straight up is given by

$$h = -16t^2 + 64t \quad \text{for } 0 \leq t \leq 4$$

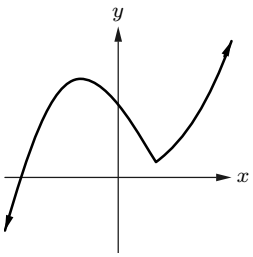
where h is in feet and t is in seconds. Find the maximum height that the object can reach.

(a) 16 feet **(b)** 32 feet **(c)** 48 feet **(d)** 64 feet **(e)** 128 feet

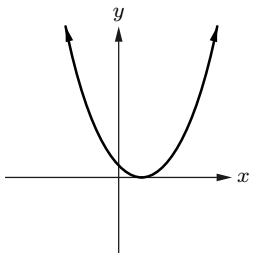
5 (5 points). Determine which graph can represent a polynomial function of degree 3.



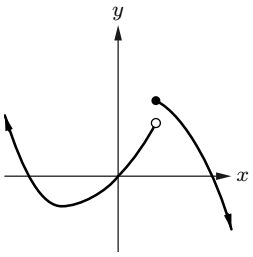
(a)



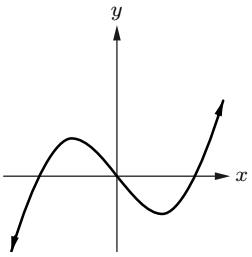
(b)



(c)



(d)



(e)

6 (5 points). Find the horizontal asymptote to the graph of the function $y = \dfrac{2x-6}{4x+8}$.

(a) $y = -2$ **(b)** $y = \frac{1}{2}$ **(c)** $y = 2$ **(d)** $y = -\frac{3}{4}$ **(e)** $y = 3$

7 (5 points). Find the vertical asymptote to the graph of the function $y = \dfrac{2x-6}{4x+8}$.

(a) $x = -2$ **(b)** $x = \frac{1}{2}$ **(c)** $x = 2$ **(d)** $x = -\frac{3}{4}$ **(e)** $x = 3$

8 (5 points). Find the solution set of the inequality $e^{x^2-3} \leq 1$.

(a) $x \leq -2$ or $x \geq 2$

(b) $-2 \leq x \leq 2$

(c) $x \leq -\sqrt{3}$ or $x \geq \sqrt{3}$

(d) $-\sqrt{3} \leq x \leq \sqrt{3}$

(e) $x \leq 2$

9 (5 points). Find the solution set of the inequality $\log_2(x+1) < 2$.

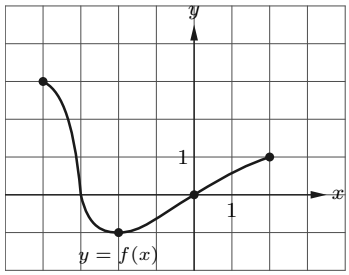
(a) $x < 1$ **(b)** $x > -1$ **(c)** $x < 3$ **(d)** $-1 < x < 3$ **(e)** $-1 \leq x < 3$

10 (5 points). The complex number i^{25} is equal to

(a) $5i$ **(b)** 1 **(c)** i **(d)** -1 **(e)** $-i$

Part II: Partial Credit Problems

11 (10 points). Questions **(a)** through **(d)** refer to the graph of the function $y = f(x)$:



(a) Write the domain of f using the interval notation $[a, b]$: _____ .

(b) Write the range of f using the interval notation $[a, b]$: _____ .

(c) Find the average rate of change of f over its domain.

Solution.

(d) On which interval is f decreasing?

Answer.

12 (10 points). Let $f(x) = x^2 + 3x$ and $g(x) = x - 2$.

(a) Find $f(-2)$.

Solution.

(b) Find the difference quotient $\dfrac{f(x+h) - f(x)}{h}$. Simplify the answer.

Solution.

(c) Find $(f \circ g)(x)$. Simplify the answer.

Solution.

13 (14 points)**.** Questions **(a)** and **(b)** refer to the quadratic function:

$$y = -2x^2 + 8x - 6$$

(a) Complete the square for $y = -2x^2 + 8x - 6$.

Solution.

(b) Graph the function $y = -2x^2 + 8x - 6$. Specify the axis of symmetry, maximum or minimum value, and x- and y-intercepts.

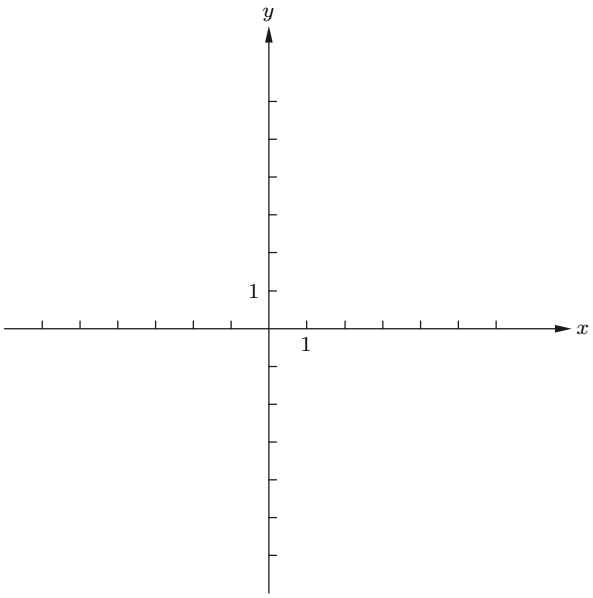
Solution.

Axis of Symmetry: _____

Maximum or Minimum Value: _____

x-Intercepts: _____

y-Intercept: _____



14 (10 points)**.** The radioactive substance Bismuth-210 has a half-life of 5.0 days.

(a) A sample of Bismuth-210 originally has a mass of 160 grams. Find a formula for the mass remaining after t days.

Solution.

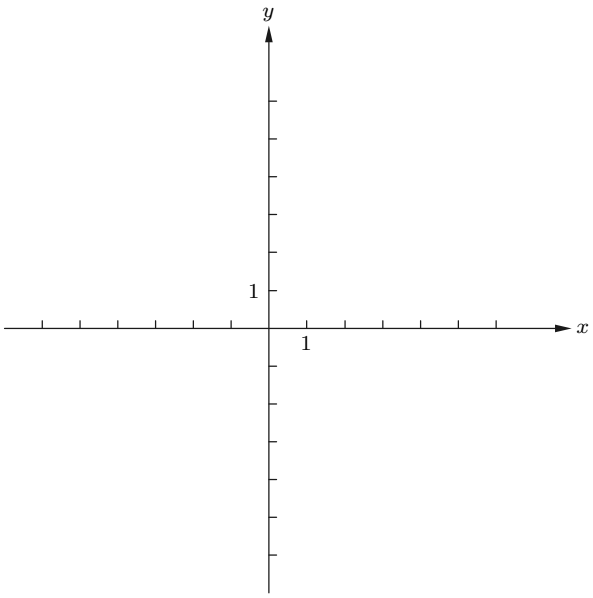
(b) When will the mass of this Bismuth-210 sample reduce to 40 grams ?

Solution.

15 (14 points)**.** Questions **(a)** through **(d)** refer to the function:

$$y = \ln(x+1) - 1$$

(a) Graph the function $y = \ln(x+1) - 1$.



(b) Write the domain and range of $y = \ln(x+1) - 1$ using the interval notation $[a, b]$.

Domain: _____ Range: _____

(c) Find an equation of the vertical asymptote to the graph of $y = \ln(x+1) - 1$.

Vertical Asymptote: _____

(d) Find the x- and y-intercepts of the graph of $y = \ln(x+1) - 1$. Show **all** your work.

Solution.

x-Intercept: _____ y-Intercept: _____

16 (9 points). Suppose that b is a positive constant greater than 1, and let A, B, and C be defined as follows:

$$\log_b 2 = A \qquad \log_b 3 = B \qquad \log_b 5 = C$$

Use the *properties of logarithms* to evaluate each expression in terms of A, B, and/or C.

(a) $\log_b 12$

Solution.

(b) $\log_b 0.8$

Solution.

(c) $\log_{3b} 3$

Solution.

17 (8 points). Solve the equation $\log_5(x-1) + \log_5(x+3) = 1$ for x.

Solution.

18 (7 points)**.** Simplify the following expressions, and write the answers in the form $a + bi$ where a and b are real numbers.

(a) $i^3 + 3i^2 + 2i + 4$

Solution.

(b) $\dfrac{3+i}{3-4i}$

Solution.

19 (8 points)**.** Questions **(a)** and **(b)** refer to the quadratic equation:

$$x^2 - 2x + 3 = 0$$

(a) Compute the discriminant of $x^2 - 2x + 3 = 0$.

Solution.

(b) Use the *quadratic formula* to obtain the two complex-conjugate roots of $x^2 - 2x + 3 = 0$.

Solution.

20 (10 points)**.** Find all the roots of the equation $3x^3 - 7x^2 + 17x - 5 = 0$, given that one of its roots is $1 - 2i$.

Solution.