

Quiz 6 will cover the following topics: all topics from Quizzes 1-5, Exams 1, 2, graphing factored polynomials, differentiation of logarithmic and exponential functions, differentiation using the product rule, quotient rule, and the chain rule, and antidifferentiation.

## Review Problems

1. Differentiate each of the following functions.

a)  $f(x) = 5^{3x^2-2}$

f)  $f(x) = \frac{\sqrt{x^3 - 5x + 1}}{x^2 - 5}$

k)  $f(x) = e^x - e^{-x}$

b)  $f(x) = (3x - 1)^{100} (2 - x)^5$

g)  $f(x) = \log_5(x^4 - 2x^2 - 7)$

l)  $f(x) = 5^{2x} - 5^{-2x}$

c)  $f(x) = 2^x + x^2$

h)  $f(x) = \frac{e^{-x^2}}{5x^2 - 1}$

m)  $f(x) = \frac{1}{3}xe^{3x} - \frac{1}{9}e^{3x}$

d)  $f(x) = \frac{x^5}{\ln x}$

i)  $f(x) = x^3 - 4x + e^3$

n)  $f(x) = 3^{\sqrt{x^8 - 3x^4 + 1}}$

e)  $f(x) = 3^{x-1} + (x-1)^3$

j)  $f(x) = e^x + e^{-x}$

o)  $f(x) = \frac{e^x}{e^x + 1}$

2. Compute each of the following indefinite integrals.

a)  $\int 6x^2 - 6x + 1 \, dx$

c)  $\int ax^2 - a + 7x \, da$

e)  $\int 2^x \, dx$

b)  $\int ax^2 - a + 7x \, dx$

d)  $\int x^2 - \sqrt{x} + \frac{1}{x} + e^x \, dx$

f)  $\int (2x - 1)^{100} \, dx$

3. Plot the graph of each of the following functions.

a)  $f(x) = x^3(16 - x^2)(x^2 - 9)^2$

b)  $f(x) = (x + 5)(5 - x)^2(2 - x)(x + 1)^2(x + 4)(x - 7)$

4. Suppose that  $g$  is a function satisfying the following conditions  $g(2) = 3$  and  $g'(2) = -4$ . Find  $f'(2)$  if  $f$  is given as

a)  $f(x) = x^2 - 4g(x)$

c)  $f(x) = \ln(5g(x))$

e)  $f(x) = x^2g(x)$

b)  $f(x) = (g(x))^3$

d)  $f(x) = -2(g(x))^4 - \frac{1}{g(x)}$

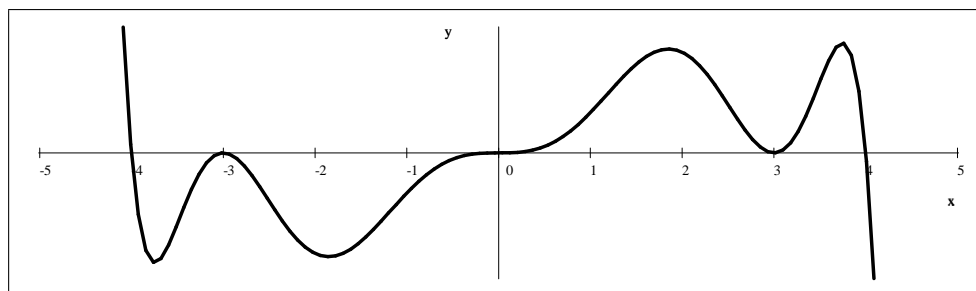
## Review Problems - Answers

1. a)  $f'(x) = 6x(\ln 5)5^{3x^2-2}$       b)  $f'(x) = -5(63x - 121)(x - 2)^4(3x - 1)^{99}$   
 c)  $f'(x) = 2^x \cdot \ln 2 + 2x$       d)  $f'(x) = \frac{5x^4}{\ln x} - \frac{x^4}{\ln^2 x}$       e)  $f'(x) = 3^{x-1} \ln 3 + 3(x-1)^2$   
 f)  $f'(x) = \frac{3x^2 - 5}{2(x^2 - 5)\sqrt{x^3 - 5x + 1}} - \frac{2x\sqrt{x^3 - 5x + 1}}{(x^2 - 5)^2}$       g)  $f'(x) = \frac{4x^3 - 4x}{\ln 5(x^4 - 2x^2 - 7)}$   
 h)  $f'(x) = -2x \frac{e^{-x^2}}{5x^2 - 1} - 10x \frac{e^{-x^2}}{(5x^2 - 1)^2} = -2xe^{-x^2} \frac{5x^2 + 4}{(5x^2 - 1)^2}$       i)  $f'(x) = 3x^2 - (\ln 4)4^x$   
 j)  $f'(x) = e^x - e^{-x}$       k)  $f'(x) = e^x + e^{-x}$       l)  $f'(x) = 2 \ln 5(5^{2x} + 5^{-2x})$       m)  $f'(x) = xe^{3x}$   
 n)  $f'(x) = 3^{\sqrt{x^8 - 3x^4 + 1}} \cdot \ln 3 \cdot \frac{8x^7 - 12x^3}{2\sqrt{x^8 - 3x^4 + 1}}$       o)  $f'(x) = \frac{e^x}{(e^x + 1)^2}$

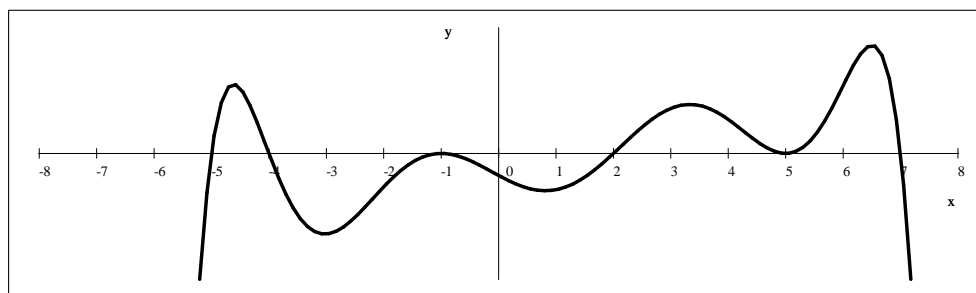
2. Compute each of the following indefinite integrals.

- a)  $2x^3 - 3x^2 + x + C$       b)  $\frac{1}{3}ax^3 + \frac{7}{2}x^2 - ax + C$       c)  $a^2 \left( \frac{1}{2}x^2 - \frac{1}{2} \right) + 7ax + C$   
 d)  $\frac{x^3}{3} - \frac{2}{3}x^{3/2} + \ln|x| + e^x + C$       e)  $\frac{2^x}{\ln 2} + C$       f)  $\frac{(2x - 1)^{101}}{202} + C$

3. a)  $f(x) = -(x + 4)(x + 3)^2 x^3 (x - 3)^2 (x - 4)$



- b)  $f(x) = -(x + 5)(x + 4)(x + 1)^2 (x - 2)(x - 5)^2 (x - 7)$



4. a) 20      b) -108      c)  $-\frac{4}{3}$       d)  $863\frac{5}{9}$       e) -4