

Math 1432 Online

Fall 2008

Midterm Review

- Determine if the following are one-to-one, if so, find $f^{-1}(x)$
 - $f(x) = x^3 + 1$
 - $f(x) = 3x + 10$
 - $f(x) = \sqrt{9 - x^2}$
- Suppose f has an inverse, $f(3) = 1$ and $f'(3) = \frac{2}{7}$. Find $(f^{-1})'(1)$.
- Suppose $f(x)$ is an invertible differentiable function and the graph of f passes through the points $(6, -1)$ and $(-1, 2)$. The slope of the tangent line to the graph of f at $x = -1$ is $7/2$. Evaluate the derivative of the inverse of f at 2.
- Find $(f^{-1})'(a)$ if $f(x) = x^3 + 1$ and $a = 9$
- Solve for x :
 - $e^{2x} = 5$
 - $\ln(x) = 15$
 - $\ln x + \ln(x - 1) = \ln 6$
- Find the derivative:
 - $y = \ln \sqrt{e^x + 4x}$
 - $y = \ln(5 - x)^6$
 - $y = x^2 e^{2x} + \ln e^{2x}$
 - $y = e^{x^2} \cdot \cosh(3x)$
 - $f(x) = \sec^2 \sqrt{x}$
 - $f(x) = \frac{e^{\sqrt{x}}}{x^3}$
 - $y = (\cos x)^{(x+7)}$
 - $f(x) = (3x - 1)^{2x+6}$
 - $f(x) = \ln(5x^2) + e^{6x} + \arctan(5 - 2x)$

7. Integrate:

a. $\int_e^{4e} \frac{1}{x} dx$

b. $\int \left(\frac{\csc^2 x}{2+5 \cot x} - e^{9x} \right) dx$

c. $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

d. $\int \frac{x+2}{x+1} dx$

e. $\int \frac{3x^2 + 3x + 3}{x^2 + 1} dx$

f. $\int \frac{\cos^3 x - \sin^2 x}{\cos^2 x} dx$

g. $\int \tan(3x) dx$

h. $\int \frac{\arctan(3x)}{1+9x^2} dx$

i. $\int_0^{\frac{\sqrt{3}}{2}} \frac{1}{\sqrt{1-x^2}} dx$

j. $\int \cos^4 x \sin^3 x dx$

k. $\int \cos^5 x \sin^2 x dx$

l. $\int \cot^3 x dx$

m. $\int x \ln(2x) dx$

n. $\int 2x \sin(3x) dx$

o. $\int \frac{x^2}{(x+1)(x-1)^2} dx$

p. $\int \frac{x^2 + 5x + 2}{(x+1)(x^2 + 1)} dx$

q. $\int \frac{2x^2}{\sqrt{9-x^2}} dx$

r. $\int \frac{2}{x\sqrt{9+x^2}} dx$

s. $\int \frac{5}{36 + (x-1)^2} dx$

8. The number N of bacteria in a culture is given by $N = 200e^{kt}$. If $N = 300$ when $t = 4$ hours, find k (to the nearest tenth) and then determine approximately how long it will take for the number of bacteria to triple in size.
9. Suppose that the population of Zeegers grows at a rate proportional to itself, doubling every 12500 years. When the Zeeger population has reached 93 percent more than their current population, they plan to invade Earth. How many years will it be before the Zeegers attack Earth?
10. At what rate r of continuous compounding does a sum of money double in 15 years?
11. Determine the exact value of each:
 - a. $\tan(\arccos \frac{4}{5})$
 - b. $\sin\left(2 \arccos\left(\frac{\sqrt{2}}{2}\right)\right)$
12. Plot the following polar coordinates:
 - a. $[3, \pi]$
 - b. $\left[-2, \frac{2}{3}\pi\right]$
13. Write the equation in polar coordinates:
 - a. $x^2 + y^2 = 4$
 - b. $x^2 + y^2 = 4x$
 - c. $(x^2 + y^2)^2 = 4xy$
 - d. $x = 4y$
14. Given $r = 4 - 8 \cos \theta$, give the formula (only) for the area inside the inner loop.
15. Given $r = 2 \sin(3\theta)$, give the formula (only) for the area of one petal.