

Math 222 – Test 1 – October 1, 1999

Put your name on your examination booklets.

You must show all your work; I will not give credit for answers without adequate justification.

Write everything, including scratch work, in the examination booklets. You do not have to do the problems in order, but be sure to identify your answers.

You may use simple calculators (without graphing or programming functions) although you should not need to. There is a short table of trig functions at the bottom of this sheet.

Do not use calculators to replace expressions involving expressions like π , powers of e , square roots or logarithms with decimal approximations.

(1) [10] $\int \cos^2 3x \, dx =$

(2) [10] $\int x \sec^2 x \, dx =$

(3) [10] $\int_0^1 \frac{\sqrt{4-x^2}}{2-x} \, dx =$

Hint: $\cos^2 u = (1 - \sin u)(1 + \sin u)$. If this doesn't help then you probably made a mistake in your trig substitution.

(4) [10] $\lim_{x \rightarrow 0} \frac{\cos x - 1}{x \sin x} =$

(5) [10] $\lim_{x \rightarrow \infty} e^x \ln(1 + 2e^{-x}) =$

(6) [10] $\int \frac{e^x}{e^{2x} + 4} \, dx =$

(7) [15] $\int_3^\infty \frac{dx}{x^2 + x} =$

(8) [15]

(a) $\frac{d}{dx} \tan^{-1} \left(\frac{1}{x} \right) =$

(b) Let $g(x) = x^4 + x + 1$ and $h = g^{-1}$. Note that $g(1) = 3$. Find $h'(3)$.

(c) Let $y = x^{\sin x}$. Find $\frac{dy}{dx}$.

(9) [10] Find the maximum value of $f(x) = \frac{\ln x}{x^2}$.

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	0
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	-1
$\tan \theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞	0