

Name

Show all your work and reasoning for maximum credit. Do not use a calculator, book, or any personal paper. You may ask about any ambiguous questions or for extra paper (but hand it back in).

1) (20 pts) Compute y' :

a) $y = \sec x \tan x$

b) $y = \tan^4(x^3)$

c) $5y^2 + \sin(y) = x^2$

d) $y = 2^x$

2) (15 pts) Compute:

a) $\lim_{x \rightarrow +\infty} \frac{e^x + 2x^2}{3e^x + 4x^4}$

b) y'' given that $y = \ln |2x|$.

c) $\lim_{x \rightarrow +\infty} \left(\frac{2+x}{x}\right)^{2x}$

3)(15 pts) Find the local linear approximation to e^x at $x_0 = 0$. Use it to approximate $e^{.05}$.

4) (10 pts) Find parametric equations for the portion of the circle that lies in the third quadrant, oriented counterclockwise.

5) (15 pts) CHOOSE ONE;

A) State and prove the Product Rule

B) Prove that the derivative of $\sin(x)$ is $\cos(x)$ using the definition of derivative, and a limit.

C) State the derivative of $\sin^{-1}(x)$ and prove your answer as done in class (and simplify using a triangle).

6) (15 pts) Answer TRUE or FALSE:

If f is a polynomial, then $g(x) = f(e^x)$ is differentiable.

If $\lim_{x \rightarrow a} f(x) = \lim_{x \rightarrow a} g(x) = L$, then $\lim_{x \rightarrow a} [f(x) + 1]g(x) = L^2 + L$

$\tan^{-1}(x)$ has two different horizontal asymptotes.

$f(x) = 2^{-x}$ has an inverse function.

$f(x) = (x^2 + x + 1)^{-1}$ is continuous.

7) (10 pts) If a particle moves at constant velocity, what can you say about its position vs time curve?

BONUS (5 pts): Compute the tricky integral, $\int \sec(x) dx$, showing all the steps.