

Name: _____

MA 2310: Test 2.2

No calculators and show all work.

1. Assume a spherical balloon is being blown up with a rate of $300 \text{ in}^3/\text{s}$.
When the radius is 3 inches how fast is the radius of the ballon increasing?

2. What intervals is $f(x) = x^3(x+1)^2$ is increasing or decreasing? Draw the first derivative number line and identify maximum and minimum.

3. What intervals is $f(x) = (x^2 - 4x + 5)e^x$ concave up or concave down?
Draw the second derivative number line and identify points of concavity.

4. We wish to build a cylindrical can with minimum surface and 200 cubic centimeters of volume. Find the dimensions of the can.

5. Compute the derivative of $y = x^{\sin(x)}$.

6. Let $s(t) = e^{2t} - 64t$ represent the position of a particle. Find the position, velocity and acceleration of the particle at time t . What is the velocity when the time is $t = 2$ seconds?

7. Find the following limits.

(a) $\lim_{x \rightarrow 0} \frac{\sin(x) - x}{7x^3}$

(b) $\lim_{x \rightarrow 0} \frac{\tan(2x)}{5x}$

(c) $\lim_{x \rightarrow 0^+} (1 + 2x^2)^{4/x^2}$

(d) $\lim_{x \rightarrow 0^+} \left(1 + \frac{1}{x}\right)^x$

8. Find the Antiderivatives for the following:

(a) $\int 3\sqrt{x} + 2\cos(x) - 2\sec^2(x) + \frac{1}{x^2} dx$

(b) $\int x^2 e^{x^3+1} dx.$ Let $u = x^3 + 1$