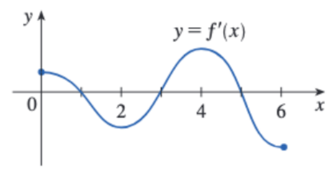
Name: ______________________ EMPLID: ______________

1. (5 points) (True/False) If $f'(c) = 0$, then f has a local maximum or minimum at c.

1. ____________

2. (5 points) The graph of the derivative f' is shown 

. At what x values does f have a local maximum?

2. ____________

3. (5 points) Find the interval(s) where $f(x) = x + \frac{4}{x^2}$ is increasing.

3. ____________

4. (5 points) Find the interval(s) where $f(x) = x^2 \ln x, x > 0$ is concave up.

4. ____________

5. (5 points) Evaluate $\lim_{x\to 0} \frac{\tan 3x}{\sin 2x}$.

5. ______________

6. (5 points) Evaluate $\lim_{x\to 1} \left(\frac{x}{x-1} - \frac{1}{\ln x}\right)$.

6. ______________

7. (10 points) Sketch the graph of $y = \frac{2x^2}{x^2-1}$. Label all asymptotes, local maximums, local minimums, and points of inflection on your graph. Hint $y' = \frac{-4x}{(x^2-1)^2}$ and $y'' = \frac{12x^2+4}{(x^2-1)^3}$.

8. (5 points) A rectangular storage container without lid is to have a volume of 10 m^3. The length of its base is twice the width. Material for the base costs \$10 per square meter. Material for the sides costs \$6 per square meter. Find the height of the container that minimizes cost.

   A. $5(\frac{9}{2})^{-\frac{2}{3}}$

   B. $5(\frac{9}{2})^{\frac{2}{3}}$

   C. $5(\frac{9}{2})^{-\frac{1}{3}}$

   D. $5(\frac{9}{2})^{\frac{1}{3}}$

   E. none of these

8. ____________

9. (5 points) Find the antiderivative of $f(t) = \frac{2t-4+3\sqrt{t}}{\sqrt{t}}$.

9. ____________

10. (5 points) Estimate the area under the graph of $f(x) = 1 + x^2$ from $x = -1$ to $x = 2$ using three rectangles and right endpoints.

10. ____________

11. (5 points) Find $g'(x)$ when $g(x) = \int_0^{x^2} \sqrt{1+t^3}\, dt$.

11. ____________