171 Exam 3 Name: _____

1. Let $f(x) = x^3 - 12x + 2$

   (a) Find the intervals over which f is increasing and decreasing

   (b) Find the intervals over which f is concave up and concave down

   (c) Find the local max and min of f

2. What does the Mean Value Theorem say about the function $f(x) = x^3 - 12x + 2$ on the interval $[0, 3]$? Be specific.

3. Suppose $f(3) = 15$ and for all x $f'(x) \leq 6$ What is the largest possible value for $f(7)$? Hint: Mean Value Theorem.

4. Use l'Hopital's rule to find the following limits

   (a) $\lim_{x \to 0} \dfrac{e^{2x} - 1}{3x}$

   (b) $\lim_{x \to \infty} \dfrac{\ln(x)}{\sqrt{x}}$

   (c) $\lim_{x \to \infty} \left(\dfrac{x+2}{x} \right)^{x}$

5. Find a general anti derivative of the following:

   (a) $f(x) = 3x^2 + 6x - 3$

   (b) $f(x) = e^x + \dfrac{1}{\sqrt{x}} + \dfrac{1}{x}$

   (c) $f(x) = \sin(x) - \cos(x)$

6. Find $F(x)$ if $F'(x) = 3x^2 + 6x - 3$ and $F(2) = 3$

7. Let $F(x) = \int_1^x \sqrt{\ln(t) + \sin(t)}dt$ then $F'(x) =$

8. Compute $\int_0^{\frac{\pi}{1}} \cos(x)dx$

9. Compute $\int_0^4 \sqrt{2x+1}dx$

10. If $\int_a^b f(t)dt = 8, \int_c^b f(t)dt = 3$ then $\int_a^c f(t)dt =$_____

11. Use Newton's method to solve $x^3 - 3x - 1 = 0$ starting with $x_1 = 2$ Just find x_2 no need to go further.

12. Find the point on the curve $y = \sqrt{x}$ closest to the point $(3, 0)$