

Full Name: _____ **Instructor & Section:** _____

Instructions: Complete this section and hand it in after 40 minutes. Use no calculators. **Show all work.**

1. For each of the following, evaluate the limit or give reasons why it does not exist. Each problem is worth 5 points.

a. $\lim_{x \rightarrow 3} \left| \frac{x^2 + x - 12}{x^2 - 6x + 9} \right|.$

b. $\lim_{r \rightarrow \infty} \frac{2r^2 - 4r^2 + 2}{7r^2 + 3r - 12 \sin r}.$

c. $\lim_{h \rightarrow 2} \frac{(h^2 - 4) \sin(h - 2)}{h^2 - 4h + 4}.$

- d. $\lim_{\theta \rightarrow \pi} H(\theta)$ where $H(\theta)$ is defined by

$$H(\theta) = \begin{cases} 2 + \cos \theta & \theta < \pi \\ 1 & \theta = \pi \\ 2 + \sin \theta & \theta > \pi. \end{cases}$$

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2. (5 points) Find $\frac{dr}{dt}$ if $r = 6t^7 - \sqrt{5} - \sqrt[3]{t} + \frac{3}{t^4}$
3. (5 points) Find $g'(z)$ if $g(z) = (2z^4 - 4\sin z)(2z - 3\cos z)$. (You do not have to simplify your answer.)
4. (5 points) Find $D_x F$ if $F(x) = \frac{x^2 + 1}{1 - 2\cos x}$. (You do not have to simplify your answer.)
5. (5 points) The equation $xy^2 = (x + 4y)^4 - 14$ defines y as a function of x . Find the value of $\frac{dy}{dx}$ at the point with $x = 2$ and $y = -1$.
6. (5 points) Find $\frac{d^3h}{ds^3}$ if $h(s) = -4\sin(3s)$.