

1. (25 points) Circle **true** if the given statement is always true. Otherwise circle **false**.

(a) The function $y = \frac{2x^2 - 242}{x + 11}$ has a vertical asymptote at $x = -11$.

true or **false** ?

(b) If $\alpha(t)$ and $\beta(t)$ are both odd functions, then $\gamma(t) = \alpha(t)\beta(t)$ is an even function.

true or **false** ?

(c) A function which is continuous at a number a must also be differentiable at a .

true or **false** ?

(d) If the finite limit $\lim_{s \rightarrow 10} \frac{w(s) - w(10)}{s - 10}$ exists, then the function w is continuous at 10.

true or **false** ?

(e) If a function $g(r)$ is not defined at $r = b$, then $\lim_{r \rightarrow b} g(r)$ does not exist.

true or **false** ?

2. (10 points) Let $g(x) = 42x - 13x^2$.

Use the definition of a derivative as a limit to prove that $g'(x) = 42 - 26x$.

Show each step in your calculation and be sure to use proper terminology in each step of your proof.

3. (10 points) The graphs of $f(x) = \ln(6) + 5 \ln(-x)$ and $g(x) = \ln(-150x^3)$ intersect. Determine the x -value for each point of intersection. Simplify your answer.

4. (10 points) What is the domain of the function $\frac{\ln(18-x)}{\sqrt{20-x} - \sqrt{x-6}}$?

5. (5 points each) Evaluate the following quantities and simplify your answers.

(a) $\csc(\arctan(12))$

(b) $\ln\left(\frac{56}{e^{18}}\right) + \ln\left(\frac{e^6}{8}\right) + 12$

(c) $9\cos\left(\frac{2\pi}{17}\right) + 18\sin^2\left(\frac{\pi}{17}\right)$

6. (5 points each) Evaluate the following limits without the use of derivatives. Show sufficient justification for each answer. An answer of 'does not exist' is not sufficient. For infinite limits you must state if it is ∞ or $-\infty$.

(a) $\lim_{x \rightarrow 8/7} \frac{49x^2 - 64}{7x - 8}$

(b) $\lim_{x \rightarrow \infty} \frac{6x^{12}(5x + 3)^2}{2 + 15x^{14}}$

(c) $\lim_{x \rightarrow 0} \frac{\sqrt{x^2 + 169} - 13}{5x^2}$

$$(d) \lim_{x \rightarrow -\infty} \frac{8 + 4/x}{7e^x}$$

$$(e) \lim_{x \rightarrow 5^+} (14 \ln(x^2 - 25) + 8e^{x-5})$$

$$(f) \lim_{x \rightarrow \infty} \frac{\sin x}{x}$$

Students – do not write on this page!

1. (25 points) _____

2. (10 points) _____

3. (10 points) _____

4. (10 points) _____

5a. (5 points) _____

5b. (5 points) _____

5c. (5 points) _____

6a. (5 points) _____

6b. (5 points) _____

6c. (5 points) _____

6d. (5 points) _____

6e. (5 points) _____

6f. (5 points) _____

TOTAL (100 points) _____