

MATH 1007 Review #1

By: Ryan Chung

- Find an equation of the line that contains the pair of points (10, 11), (2, 3).
Solution. $y = x + 1$
- Write an equation containing (2, 1) and parallel to $x + 6y = 8$.
Solution. $y = -\frac{1}{6}x + \frac{4}{3}$
- Express $x^3 - 5x^2 \geq 18x - 2x^2$ in interval notation.
Solution. $x \in [-3, 0] \cup [6, \infty)$
- If $f(x) = x^2 + x + 4$ and $g(x) = x - 3$, find $f(g(x))$ and $g(f(3))$.
Solution. $f(g(x)) = 2x - 2$
 $g(f(3)) = 4$
- Determine domain and range of $\sqrt{2x} + 4$.
Solution. Domain: $[0, \infty)$, Range: $[4, \infty)$
- Determine domain and range of $\frac{7}{3-x}$.
Solution. Domain: $(-\infty, 3) \cup (3, \infty)$, Range: $(-\infty, 0) \cup (0, \infty)$
- Determine domain of $\frac{x^2 + 11x + 24}{x^2 + 8x + 15}$.
Solution. Domain: $(-\infty, -5) \cup (-5, -3) \cup (-3, \infty)$
- Given $\sin x = \frac{3}{5}$, find $\cos x$ and $\tan x$ if x lies in the interval $x \in [0, \frac{\pi}{2}]$.
Solution. $\cos x = \frac{4}{5}$, $\tan x = \frac{3}{4}$
- Find the exact value of $\sin(\frac{\pi}{4} + \frac{\pi}{3})$.
Solution. $\frac{\sqrt{6} + \sqrt{2}}{4}$
- Find the domain and range of $f^{-1}(x)$ if $f(x) = \frac{x+5}{x-8}$.
Solution. $f^{-1}(x) = \frac{-5-8x}{1-x}$
Domain: $(-\infty, 1) \cup (1, \infty)$
Range: $(-\infty, 8) \cup (8, \infty)$
- Compute $f^{-1}(x) = \frac{100}{8+6-x}$
Solution. $-\frac{\log(\frac{100}{x}-8)}{\log 6}$
- Express $\ln 4\sqrt{3}$ in terms of $\ln 2$ and $\ln 3$.
Solution. $\ln 4 + \ln \sqrt{3}$
- Solve $\ln(y-4) - \ln 3 = x + \ln x$ for y in terms of x .
Solution. $3xe^x + 4$
- Express in the form $a \log x + b \log y + c \log z$:
 $\sqrt[3]{\frac{x^8}{y^3 z^2}}$.
Solution. $\frac{8}{3} \log x - \log y - \frac{2}{3} \log z$
- Determine an interval where $|x+6| < 6$ and $x \leq -4$.
Solution. $x \in (-12, 4]$
- Determine if $f(x) = \frac{1}{x^2+2}$ is even, odd or neither.
Solution. Even
- Determine if $f(x) = \frac{-3x^3}{9x^2-5}$ is even, odd or neither.
Solution. Odd
- Find the limit of $\lim_{x \rightarrow 5} \frac{x+5}{x+4}$.
Solution. $\frac{10}{9}$
- Find the limit of $\lim_{x \rightarrow 0} \cos(\frac{\pi}{\sqrt{14-5\cos 2x}})$.
Solution. $\frac{1}{2}$
- Find the limit of $\lim_{x \rightarrow 4} \frac{\frac{1}{x}-\frac{1}{4}}{x-4}$.
Solution. $-\frac{1}{16}$
- Find the limit of $\lim_{x \rightarrow -5^-} f(x)$ and $\lim_{x \rightarrow -5^+} f(x)$ given the function $f(x) = (x+11)\frac{|x+5|}{x+5}$.
Solution. $\lim_{x \rightarrow -5^-} f(x) = -6$, $\lim_{x \rightarrow -5^+} f(x) = 6$
- Find the limit of $\lim_{\theta \rightarrow 0} \frac{\theta \csc(8\theta)}{\cos(10\theta)}$ using $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$.
Solution. $\frac{1}{8}$
- Find the limit of $\lim_{x \rightarrow \infty} (\sqrt{36x^2 + 6x} - \sqrt{36x^2 - 5})$
Solution. $\frac{1}{2}$
- Where is $y = \log(8x - 24)$ continuous?
Solution. $(3, \infty)$
- Define $f(7)$ that extends $f(x) = \frac{8x^2 - 392}{8x - 56}$ to be continuous at $x = 7$.
Solution. Define $f(7)$ as 14

MATH 1007 Review #2
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1. Find the equation of the tangent line of $y = 5 - 7x^2$ at $(3, -58)$
2. Find the equation of the tangent line of $f(x) = \frac{5x}{x-3}$ at $(4, 20)$
3. Given $f(x) = 3x^2 - x + 2$, find the derivative using $\lim_{z \rightarrow x} \frac{f(z) - f(x)}{z - x}$
4. Given $f(x) = 3 + \sqrt{5x}$, find the derivative using $\lim_{z \rightarrow x} \frac{f(z) - f(x)}{z - x}$
5. Find derivative of $f(x) = (2x^2 - 3x + 8)(\cos(x) + 29^x)$
6. Find $\frac{dy}{dx}$ of $y = 6x^2 \sin x + 12x \cos x - 12 \sin x$
7. Find $\frac{dy}{dx}$ of $y = \frac{6e^x}{7x}$
8. Find $\frac{dy}{dx}$ of $y = \sin^2(9\pi x - 2)$
9. Differentiate $f(x) = \ln[\ln(\ln(5x))]$
10. Find $\frac{dy}{dx}$ of $y = \sin^{-1}(\sqrt{15}x)$
11. Implicitly differentiate $(7x^2 + 5)^2 = 28y$
12. Implicitly differentiate $e^{x^2y} = 7x + 6y + 3$
13. Use logarithmic differentiation to find the derivative of $y = \frac{x\sqrt{x^2+2}}{(x+4)^{5/3}}$
14. Find $f'(x)$ and $f''(x)$ of $f(x) = \frac{2x^5+6}{x^3}$
15. Implicitly differentiate to find the first and second derivative of $3x^2 + 2y^2 = 9$
16. Find the linearization $L(x)$ of $f(x) = \cot x$ at $x = \frac{3\pi}{4}$
17. Find the absolute extrema of $f(x) = -4\sqrt{4-x^2}$, $-2 \leq x \leq 1$
18. Differentiate $\lim_{x \rightarrow 0} \frac{3x^2}{2\ln(\sec x)}$ using l'Hôpital's Rule
19. Differentiate $\lim_{x \rightarrow 0} \frac{\sqrt{3x+1}-1}{y}$ using l'Hôpital's Rule
20. Find limit of $\lim_{x \rightarrow \infty} (\ln 4x - \ln(x+6))$ using l'Hôpital's Rule
21. Find the limit of $\lim_{x \rightarrow 0^+} x^{\frac{-2}{\ln x}}$

Solutions

1. $y = -42x + 68$
2. $80 - 15x$
3. $6x - 1$
4. $\frac{\sqrt{5}}{2\sqrt{x}}$
5. $f'(x) = (4x - 3)(\cos x + 29^x) + (-\sin x + 29^x \ln 29)(2x^2 - 3x + 8)$
6. $6x^2 \cos x$
7. $\frac{dy}{dx} = \frac{6e^x(x-1)}{7x^2}$
8. $18\pi \cos(9\pi x - 2) \sin(9\pi x - 2)$
9. $\frac{1}{x \ln(5x) \ln(\ln(5x))}$
10. $\frac{dy}{dx} = \frac{\sqrt{15}}{\sqrt{1-15x^2}}$
11. $\frac{dy}{dx} = 7x^3 + 5x$
12. $\frac{dy}{dx} = \frac{7-2e^{x^2} y x y}{e^{x^2} y x^2 - 6}$
13. $\frac{dy}{dx} = \left(\frac{1}{x} + \frac{x}{x^2+2} - \frac{5}{3(x+4)}\right) \left(\frac{x\sqrt{x^2+2}}{\sqrt[3]{(x+4)^5}}\right)$
14. $f'(x) = \frac{2x^5-9}{x^4}, f''(x) = \frac{4x^5+72}{x^5}$
15. $\frac{dy}{dx} = \frac{-3x}{2y}, \frac{d^2y}{dx^2} = \frac{-3(2y^2+3x^2)}{4y^3}$
16. $L(x) = -1 - 2\left(x - \frac{3\pi}{4}\right)$
17. Maximum $(-2, 0)$, minimum $(0, -8)$
18. 3
19. $\frac{3}{2}$
20. $\ln 4$
21. $\frac{1}{e^2}$