

MATH 185 REVIEW PROBLEMS

1. Evaluate $\lim_{x \rightarrow -8} \frac{x^2+5x-24}{5x+40}$.
2. Find $f'(x)$ using the limit definition of the derivative: $f(x) = \sqrt{2x+1}$.
3. Find $y'|_{x=2}$ for $y = (2x+1)^{\frac{2}{3}}(x^3-3x^2)$. Give an exact value.
4. Find $\frac{dy}{dx}$ for $y = \frac{8x^2+3}{5x+1}$. Simplify.
5. Find y' given $\cos(xy) - \sin(3y) = 1 + x^3$.
6. Find the equation of the tangent line to $y = \ln[x^3(x^2+4)]$ at $x = 1$. Write your answer in slope-intercept form.
7. We want to solve $e^x = \cos x + 1$ on the interval $[-3, -2]$. Use Newton's Method with $x_0 = -3$ to find x_1 . Round your answer to 2 decimal places.
8. An object's position (in metres) is given by: $x = e^{-t^2+8t}$, $y = te^{7t}$. Find its velocity at $t = 0.2$ seconds. Round to 1 decimal place.
9. Water is stored in a cone-shaped container with height 14m and radius 5m. The water is dripping out of a small hole in the bottom at a rate of $2\text{m}^3/\text{h}$. At what rate is the water's depth changing when the depth is 6m?
10. For the function $f(x) = x^8 - 4x^6$:
 - a) Find all x - and y -intercepts
 - b) Find any relative maximum or minimum points
11. Let $f(x) = \frac{x^2-5x}{x+2}$
 - a) Find any horizontal or slant asymptotes
 - b) Find any relative maximum or relative minimum points. Round the coordinates to one decimal place.
12. A cylinder's radius and height must add to 30cm. Find the maximum volume of the cylinder.

13. Approximate $\sin(\frac{5\pi}{18})$ using differentials.
14. Find $f'(\frac{\pi}{6})$ for $f(x) = \csc^2(2x) + \tan^{-1}(5x)$. Round to 1 decimal place.
15. Find $f'(0)$ for $f(x) = \log_2(x^2 + 5x + 1) + 2^{4x}$. Simplify.
16. Use the quotient rule to show that $\frac{d}{dx}[\tan x] = \sec^2 x$.
17. Let $\vec{A} = 7\vec{i} - 6\vec{j} + 4\vec{k}$ and $\vec{B} = 3\vec{i} + 5\vec{j} + 5\vec{k}$.
- a) Find $\vec{A} \times \vec{B}$
- b) Find the angle between \vec{A} and \vec{B} . Round your answer to 1 decimal place.
- c) Find $\text{proj}_{\vec{A}}(\vec{B})$

18. a) Find the inverse of $\begin{bmatrix} 1 & 2 & -3 \\ 2 & 3 & -4 \\ 3 & 0 & 1 \end{bmatrix}$

- b) Use part a) to solve the system below:

$$\begin{aligned}x + 2y - 3z &= -11 \\2x + 3y - 4z &= -14 \\3x &+ z = 9\end{aligned}$$

19. Solve the system below using Gauss-Jordan Elimination:

$$\begin{aligned}2x + 8y - 10z &= -2 \\3x + 5y + 6z &= 4 \\4x + 2y + 22z &= 10\end{aligned}$$