ANSWERS TO PRACTICE MIDTERM EXAM

Pencil and paper

1. \( y' = 6x^2 + \frac{2}{x^3} - \frac{3}{2}x^{-3/2} \)
2. \( y' = 6x \tan x + 3x^2 \sec^2 x \)
3. \( y' = \frac{\sec x \tan x(x^2 + 1) - \sec x(2x)}{(x^2 + 1)^2} \)
4. \( y' = 2x \sin(x^2) - 2 \cos x \sin x \)
5. \( y' = \csc x \cot x + \csc^3 x \)
6. \( y' = \frac{(2x)(x^2 + 1) - (x^2 - 1)(2x)}{(x^2 + 1)^2} \)
7. \( y' = \frac{1}{2}(2 - x^{1/2})^{-1/2}(-\frac{1}{2}x^{-1/2}) \)
8. \( y' = \frac{2 + y \cos(xy)}{2y - x \cos(xy)} \)
9. The limit is 9.
10. The limit is \( \frac{8}{5} \).

General problems

1. \( f'(x) = \lim_{h \to 0} \frac{\sqrt{2(x + h)} - \sqrt{2x}}{h} = \frac{1}{\sqrt{2x}} \)
2. \((-2, -8)\) (Note that the line \( y = 12x + 16 \) and the curve \( y = x^3 \) also intersect at \((4, 64)\), but the slope of the tangent line to the curve at \((4, 64)\) isn’t 12.)
3. The horizontal asymptote is \( y = 5 \). The vertical asymptote is \( x = -2 \). For the limits, \( \lim_{x \to -2} f(x) = \lim_{x \to -2} f(x) = \infty \).
4. The volume is approximately \( \frac{1495}{2\pi} \).
5. \( \frac{4}{9\pi} \).