MAT 270 - Derivative Practice I

Find the derivative of each of the following functions and simplify.

1. $f(x) = 4x^3 - 3x^2 + 2x - \pi$

2. $f(x) = \dfrac{x^2}{3} - \dfrac{3}{x^2}$

3. $f(x) = -3(2x^2 - 5x + 1)$

4. $f(x) = \sqrt{x} - \dfrac{1}{\sqrt{x}}$

5. $f(x) = \dfrac{x+1}{x-2}$

6. $f(x) = \dfrac{x^2 - 2}{x^2}$

7. $f(x) = \dfrac{x^2}{x^2 - 2}$

8. $f(x) = \sqrt{x}(x^2 + 1)$

9. $f(x) = \dfrac{e^x}{e^x - 1}$

10. $f(x) = \dfrac{2}{\sqrt{x}} + \dfrac{\sqrt{x}}{2}$

11. $f(x) = \dfrac{2x}{x-1}$

12. $f(x) = (3x - 2)(2x + 1)$

13. $y = 5x^2 - 5\sqrt{x} - \dfrac{3}{x}$

14. $y = \dfrac{\sqrt{x}}{\sqrt{x} - 1}$

15. $y = \dfrac{e^x}{x}$

16. $y = 6x^{-\frac{3}{2}} + 7x^{\frac{1}{5}} + 1$

17. $y = \dfrac{-7}{1 - x^3}$

18. $y = \dfrac{4}{3}x^{\left(\frac{3}{4} - \pi\right)}$

19. $y = \dfrac{1}{7x}$

20. $y = 2x^{\left(\frac{1}{2} - e\right)}$

Bonus:

$y = e^{\ln x^2} - 3x^{-7}$

MAT 270 - Derivative Practice I Solutions

1. $f(x) = 4x^3 - 3x^2 + 2x - \pi$
   $f'(x) = 12x^2 - 6x + 2$

2. $f(x) = \dfrac{x^2}{3} - \dfrac{3}{x^2}$

   $f'(x) = \dfrac{2}{3}x + \dfrac{6}{x^3}$

3. $f(x) = -3(2x^2 - 5x + 1)$
   $f'(x) = 12x + 15$

4. $f(x) = \sqrt{x} - \dfrac{1}{\sqrt{x}}$

   $f'(x) = \dfrac{1}{2\sqrt{x}} + \dfrac{1}{2x\sqrt{x}}$

5. $f(x) = \dfrac{x+1}{x-2}$

   $f'(x) = \dfrac{-3}{(x-2)^2}$

6. $f(x) = \dfrac{x^2 - 2}{x^2}$

   $f'(x) = \dfrac{4}{x^3}$

7. $f(x) = \dfrac{x^2}{x^2 - 2}$

   $f'(x) = \dfrac{-4x}{(x^2 - 2)^2}$

8. $f(x) = \sqrt{x}(x^2 + 1)$

   $f'(x) = \dfrac{5x\sqrt{x}}{2} + \dfrac{1}{2\sqrt{x}}$

9. $f(x) = \dfrac{e^x}{e^x - 1}$

$f'(x) = \dfrac{-e^x}{\left(e^x - 1\right)^2}$

10. $f(x) = \dfrac{2}{\sqrt{x}} + \dfrac{\sqrt{x}}{2}$

$f'(x) = \dfrac{-1}{x\sqrt{x}} + \dfrac{1}{4\sqrt{x}}$

11. $f(x) = \dfrac{2x}{x - 1}$

$f'(x) = \dfrac{-2}{(x - 1)^2}$

12. $f(x) = (3x - 2)(2x + 1)$

$f'(x) = 12x - 1$

13. $y = 5x^2 - 5\sqrt{x} - \dfrac{3}{x}$

$y' = 10x - \dfrac{5}{2\sqrt{x}} + \dfrac{3}{x^2}$

14. $y = \dfrac{\sqrt{x}}{\sqrt{x} - 1}$

$y' = \dfrac{-1}{2\sqrt{x}\left(\sqrt{x} - 1\right)^2}$

15. $y = \dfrac{e^x}{x}$

$y' = \dfrac{e^x}{x} - \dfrac{e^x}{x^2}$

16. $y = 6x^{\frac{-3}{2}} + 7x^{\frac{1}{5}} + 1$

$y' = -9x^{\left(\frac{-5}{2}\right)} + \frac{7}{5}x^{\left(\frac{-4}{5}\right)}$

17. $y = \dfrac{-7}{1-x^3}$

$y' = \dfrac{-21x^2}{\left(1-x^3\right)^2}$

18. $y = \dfrac{4}{3}x^{\left(\frac{3}{4}-\pi\right)}$

$\left(1 - \dfrac{4}{3}\pi\right)x^{\left(\frac{-1}{4}-\pi\right)}$

19. $y = \dfrac{1}{7x}$

$y' = \dfrac{-1}{7x^2}$

20. $y = 2x^{\left(\frac{1}{2}-e\right)}$

$y' = (1-2e)x^{\left(\frac{-1}{2}-e\right)}$

Bonus:

$y = e^{\ln x^2} - 3x^{-7}$

$y' = \dfrac{2e^{\ln x^2}}{x} + \dfrac{21}{x^8}$