MATH 12002 GATEWAY EXAM #1 SEPTEMBER 26, 2016

Take the derivative of the following functions. **Do not simplify your answers.** You have 50 minutes to complete this exam. Please put a box around your final answers.

Name: Key

1. $f(x) = 2x^4 - 3x^2 + 5x + 2$

$$\boxed{f'(x) = 8x^3 - 6x + 5}$$

2. $f(x) = \sqrt{x} - \frac{1}{\sqrt{x}} = x^{\frac{1}{2}} - x^{-\frac{1}{2}}$

$$\boxed{f'(x) = \frac{1}{2}x^{-\frac{1}{2}} + \frac{1}{2}x^{-\frac{3}{2}}}$$

3. $f(x) = 12x^4 + 3x^3 + 5x^{-2} - 4$

$$\boxed{f'(x) = 48x^3 + 9x^2 - 10x^{-3}}$$

4. $f(x) = (x^3 + 7x^2 + 5)^5$

$$\boxed{f'(x) = 5 \cdot (x^3 + 7x^2 + 5)^4 \cdot (3x^2 + 14x)}$$

5. $f(x) = (6x - 5)^{-3}$

$$\boxed{f'(x) = -3(6x - 5)^{-4} \cdot 6}$$

6. $f(x) = x^{-5}(4x^2 + 6)$

$$f'(x) = -5x^{-6}(4x^2+6) + 8x(x^{-5})$$

7. $f(x) = \dfrac{2x+3}{3x+2}$

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

8. $f(x) = \dfrac{x + x^3}{\sqrt{x}}$

$$f'(x) = \frac{(1+3x^2)(x^{\frac{1}{2}}) - \frac{1}{2}x^{-\frac{1}{2}}(x+x^3)}{(\sqrt{x})^2}$$

9. $f(x) = \dfrac{x^2}{x^2+1}$

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

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

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

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

$$f'(x) = 1 \cdot \sqrt{1-x^2} + \frac{1}{2} \cdot (-2x)\left(1-x^2\right)^{-\frac{1}{2}} \cdot x$$

12. $f(x) = \dfrac{3}{\sqrt{2x + 1}} = 3\left(2x+1\right)^{-\frac{1}{2}}$

$$f'(x) = \left(-\frac{1}{2}\right) \cdot 3 \cdot 2\left(2x+1\right)^{-\frac{3}{2}}$$

13. $f(x) = \cos(3x)$

$$f'(x) = 3 \cdot \left(-\sin(3x)\right)$$

14. $f(x) = x \cos x$

$$f'(x) = 1 \cdot \cos(x) - x\sin(x)$$

15. $f(x) = \sin(2x) \cos(3x)$

$$f'(x) = 2\cos(2x) \cdot \cos(3x) - 3\sin(3x)\sin(2x)$$

Cont.

16. $f(x) = \sin^2 x + \cos^2 x$

$$f'(x) = 2\sin(x)\cos(x) - 2\cos(x)\sin(x) = 0$$

17. $f(x) = \dfrac{\cos x}{1 + \sin x}$

$$f'(x) = \frac{-\sin(x)\left(1+\sin(x)\right) - \cos^2(x)}{\left(1+\sin(x)\right)^2}$$

18. $f(x) = \dfrac{1 - \sin x}{1 + \sin x}$

$$f'(x) = \frac{-\cos(x)\left(1+\sin(x)\right) - \cos(x)\left(1-\sin(x)\right)}{\left(1+\sin(x)\right)^2}$$

19. $f(x) = \sin(\cos x)$

$$f'(x) = \cos(\cos(x)) \cdot \left(-\sin(x)\right)$$

20. $f(x) = (\sin x + \tan x)^{1/5}$

$$f'(x) = \frac{1}{5}\left(\sin(x) + \tan(x)\right)^{-\frac{4}{5}} \cdot \left(\cos(x) + \sec^2(x)\right)$$

The End.