AP Calculus: Practice Fundamental Theorem of Calculus / Basic Integrals

Find the following derivatives using the Fundamental Theorem of Calculus:

1. $\frac{d}{dx}\int_2^x t^2\ dt$

2. $\frac{d}{dx}\int_\pi^x \cos t\ dt$

3. $\frac{d}{dx}\int_x^e \tan^{-1} t\ dt$

4. $\frac{d}{dx}\int_x^{\sqrt{2}} \frac{1}{1+t^2}\ dt$

5. $\frac{d}{dx}\int_{\pi^2}^{x^2} \frac{1}{\sqrt{1-t^2}}\ dt$

6. $\frac{d}{dx}\int_{x^2}^{x^4} \cos t\ dt$

7. $\frac{d}{dx}\int_x^x \sec t\ dt$

8. $\frac{d}{dx}\int_{\sin x}^{x^2} t^3\ dt$

Simplify the following indefinite integrals:

9. $\int \frac{2x}{\sqrt{x^2-1}}\ dx$

10. $\int \sec x \tan x\ dx$

11. $\int \sqrt{x} - \sqrt[5]{x}\ dx$

12. $\int \frac{\left(x^2-2\right)}{\sqrt[8]{x}}\ dx$

13. $\int \frac{x}{x+1}\ dx$

14. $\int \frac{2x}{\sqrt{1+x}}\ dx$

15. $\int \sin 3x\ dx$

16. $\int x^2\sqrt{1-x^3}\ dx$

Find the following definite integrals:

17. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \sin x\ dx$

18. $\int_0^1 \frac{1}{x^2+6x+9}\ dx$

19. $\int_0^1 \frac{8}{3+4x}\ dx$

20. $\int_1^3 \frac{8x}{3+4x}\ dx$

21. $\int_0^1 \frac{8}{\sqrt{3+4x}}\ dx$

22. $\int_0^\pi \sin 3x\ dx$

23. $\int_1^3 \frac{2}{(x+1)^2}\ dx$

24. $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} 1+\sin x\ dx$