Non-AP Calculus 4.1 Quiz Review WS #1

Find the antiderivative

1. $\int 2x^6 + 5x + \frac{2}{\sqrt[4]{x}} - \frac{\sqrt{x^5}}{2} - \pi x + \frac{7}{5x^2}\, dx$

2. $\int -3\sec x \tan x - 2\cos x dx$

3. $\int \frac{4x^5 + \sqrt[3]{x} - 7\sqrt{x}}{2\sqrt{x}}\, \mathrm{dx}$

4. $\int 3(2x-1)^2 - 5\,dx$

5. Find the most general expression of $f(x)$ if $f''(x) = 2x^2 + 6x - 11$.

6. Find the specific expression of $f(x)$ if $f''(x) = -32$, $f'(2) = 0$, and $f(2) = 69$.

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Find the antiderivative

*Power Rule Conditions:

1) Radicals to Rationals

2)

3) Expand terms out (no parentheses)

Key

1. $\int 2x^6 + 5x + \frac{2}{\sqrt[4]{x}} - \frac{\sqrt{x^5}}{2} - \pi x + \frac{7}{5x^2}\,dx$

$\int 2x^6 + 5x + 2x^{-1/4} - \frac{1}{2}x^{5/2} - \pi x + \frac{7}{5}x^{-2}\,dx$

$\frac{2x^7}{7} + \frac{5x^2}{2} + \frac{2x^{+3/4}}{+3/4} - \frac{1}{2}\cdot\frac{x^{7/2}}{7/2} - \frac{\pi x^2}{2} + \frac{7}{5}\cdot\frac{x^{-1}}{-1} + C$

$\frac{2}{7}x^7 + \frac{5}{2}x^2 + 2\cdot\frac{4}{3}x^{3/4} - \frac{1}{2}\cdot\frac{2}{7}x^{7/2} - \frac{\pi}{2}x^2 - \frac{7}{5}x^{-1} + C$

$\boxed{\frac{2}{7}x^7 + \frac{5}{2}x^2 + \frac{8}{3}x^{3/4} - \frac{1}{7}x^{7/2} - \frac{\pi}{2}x^2 - \frac{7}{5x} + C}$

2. $\int -3\sec x\tan x - 2\cos x\,dx$

$-3\int \sec x\tan x\,dx - 2\int \cos x\,dx$

$-3(\sec x) - 2(\sin x) + C$

$\boxed{-3\sec x - 2\sin x + C}$

3. $\int \frac{4x^5 + \sqrt[3]{x} - 7\sqrt{x}}{2\sqrt{x}}\,dx$

$\frac{1}{2}\int \frac{4x^5 + x^{1/3} - 7x^{1/2}}{x^{1/2}}\,dx$

$\frac{1}{2}\int (4x^5 + x^{1/3} - 7x^{1/2})x^{-1/2}\,dx$

$\frac{1}{2}\int 4x^{10/2}x^{-1/2} + x^{2/6}x^{-3/6} - 7x^{1/2}x^{-1/2}\,dx$

$= \frac{1}{2}\int 4x^{9/2} + x^{-1/6} - 7\,dx$

$\int 2x^{9/2} + \frac{1}{2}x^{-1/6} - \frac{7}{2}\,dx$ $\quad +2/2 \quad +6/6$

$2\left(\frac{x^{11/2}}{11/2}\right) + \frac{1}{2}\cdot\frac{x^{5/6}}{5/6} - \frac{7}{2}x + C$

$2\cdot\frac{2}{11}x^{11/2} + \frac{1}{2}\cdot\frac{6}{5}x^{5/6} - \frac{7}{2}x + C$

$\boxed{\frac{4}{11}x^{11/2} + \frac{3}{5}x^{5/6} - \frac{7}{2}x + C}$

4. $\int 3(2x-1)^2 - 5\,dx$

$\int 3(2x-1)(2x-1) - 5\,dx$

$\int 3[4x^2-4x+1] - 5\,dx$

$\int 12x^2 - 12x + 3 - 5\,dx$

$\int 12x^2 - 12x - 2\,dx$

$\frac{12x^3}{3} - \frac{12x^2}{2} - 2x + C$

$\boxed{4x^3 - 6x^2 - 2x + C}$

5. Find the most general expression of $f(x)$ if $f''(x) = 2x^2 + 6x - 11$.

$f'(x) = \int 2x^2 + 6x - 11\,dx$

$f'(x) = \frac{2x^3}{3} + \frac{6x^2}{2} - 11x + C$

$f'(x) = \frac{2}{3}x^3 + 3x^2 - 11x + C$

$f(x) = \int \frac{2}{3}x^3 + 3x^2 - 11x + C\,dx$

$f(x) = \frac{2}{3}\cdot\frac{x^4}{4} + \frac{3x^3}{3} - \frac{11x^2}{2} + Cx + K$

$\boxed{f(x) = \frac{1}{6}x^4 + x^3 - \frac{11x^2}{2} + Cx + K}$

6. Find the specific expression of $f(x)$ if $f''(x) = -32$, $f'(2) = 0$, and $f(2) = 69$.

$f''(x) = -32$

$f'(2)=0$ $f'(x) = \int -32\,dx$

$f'(x) = -32x + C$

$0 = -32(2) + C$

$0 = -64 + C$

$64 = C$

$f'(x) = -32x + 64$

$f(2)=69$

$f(x) = \int -32x + 64\,dx$

$f(x) = -\frac{32x^2}{2} + 64x + K$

$f(x) = -16x^2 + 64x + K$

$69 = -16(2)^2 + 64(2) + K$

$69 = -64 + 128 + K$

$69 = 64 + K$

$5 = K$

$f(x) = -16x^2 + 64x + 5$

$\boxed{f(x) = -16x^2 + 64x + 5}$