Quiz 4b **Calculus 2** **3/19/04**

Each problem is worth 5 points. For full credit provide proper justification for your answer.

1. Find the Taylor polynomial of degree 3 approximating the function $f(x) = \sqrt{x+1}$ for x near zero.

$P_3(x) = f(0) + f'(0)x + \frac{f''(0)}{2!}x^2 + \frac{f'''(0)}{3!}x^3$

$f(x) = \sqrt{x+1} = (x+1)^{1/2}$ $\quad f(0) = 1$

$f'(x) = \frac{1}{2}(x+1)^{-1/2}$ $\quad f'(0) = \frac{1}{2}$

$f''(x) = -\frac{1}{4}(x+1)^{-3/2}$ $\quad f''(0) = -\frac{1}{4}$

$f'''(x) = \frac{3}{8}(x+1)^{-5/2}$ $\quad f'''(0) = \frac{3}{8}$

$P_3(x) = 1 + \frac{1}{2}x - \frac{0.25}{2!}x^2 + \frac{0.375}{3!}x^3$

$P_3(x) = 1 + \frac{1}{2}x - \frac{1}{8}x^2 + \frac{1}{16}x^3$

Good

2. Find the Taylor polynomial of degree 5 for the function $g(x) = \sin x$ centered at $x = 0$.

$f(a) + f'(a)(x-a) + \frac{f''(a)(x-a)^2}{2!}$

$f(x) = \sin x$ $\quad f(0) = 0$

$f'(x) = \cos x$ $\quad f'(0) = 1$

$f''(x) = -\sin x$ $\quad f''(0) = 0$

$f'''(x) = -\cos x$ $\quad f'''(0) = -1$

$f^4(x) = \sin x$ $\quad f^4(0) = 0$

$f^5(x) = \cos x$ $\quad f^5(0) = 1$

$P(x) = f(0) + f'(0)x + \frac{f''(0)x^2}{2!} + \frac{f'''(0)x^3}{3!} + \frac{f^4(0)x^4}{4!} + \frac{f^5(0)x^5}{5!}$

$\cancel{0} + 1x + \frac{0x^2}{2!} - \frac{1x^3}{3!} + \frac{0x^4}{4!} + \frac{1x^5}{5!}$

$\boxed{\sin x \approx x - \frac{1}{6}x^3 + \frac{1}{120}x^5}$

Great