Assignment: Homework Four   Name: Cody Strange
Disclaimer: This is my work, not that of others
Total Score: 30 (in points, not percentage)
Problem 1 score: 5
Problem 2 score: 5
Problem 3 score: 5
Problem 4 score: 5
Problem 5 score: 5
Problem 6 score: 5

1a.

$$f(x) = \cos(5x)$$
$$f'(x) = -5\sin(5x)$$
$$f''(x) = -25\cos(5x)$$

$$f(0) = \cos(0) = 1$$
$$f'(0) = -5\sin(0) = 0$$
$$f''(0) = -25\cos(0) = -25$$

$$f(x) = f(0) + f'(0)x + \frac{1}{2!}f''(0)x^2$$
$$= 1 + 0\cdot x + \frac{-25x}{2\cdot 1}$$
$$= 1 - \frac{25x}{2}x^2$$

1-(25x/2)x²

1b.

$$f(x) = \frac{1}{x+1}$$

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

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

$$f(0) = 1$$

$$f'(0) = -1$$

$$f''(0) = 2$$

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

$$= 1 + -1x + \frac{2}{2!}x^2$$

$$= 1 + -1x + \frac{2}{2}x^2$$

$$= 1 - x + x^2$$

$1-x+x^2$

2a.

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

$$f'(x) = \frac{d}{dx}(x^m) = mx^{m-1} = -2x^{-2-1} = -2x^{-3}$$

$$f''(x) = \frac{d}{dx}(c \cdot u) = c\frac{d}{dx} = \frac{d}{dx}(mx^{m-1}) = -2 \cdot \frac{d}{dx}(-3x^{-3-1}) = 6x^{-4}$$

$$f'''(x) = \frac{d}{dx}(c \cdot u) = c\frac{d}{dx} = 6 \cdot \frac{d}{dx}(mx^{m-1}) = 6 \cdot \frac{d}{dx}(-4x^{-4-1}) = -24x^{-5}$$

$$f''''(x) = \frac{d}{dx}(c \cdot u) = c\frac{d}{dx} = -24 \cdot \frac{d}{dx}(mx^{m-1}) = -24\frac{d}{dx}(-5x^{-5-1}) = 120x^{-6}$$

$$f'''''(x) = d_x(c \cdot u) = c\frac{d}{dx} = 120 \cdot \frac{d}{dx}(mx^{m-1}) = 120\frac{d}{dx}(-6x^{-6-1}) = -720x^{-7}$$

$f(1) = 1$

$f'(1) = -2$

$f''(1) = 6$

$f'''(1) = -24$

$f''''(1) = 120$

$f'''''(1) = -720$

$=1+$

$=1.$

$$f(x) = f(1) + f'(1)x + \frac{f''(1)}{2!}x^2 + \frac{f'''(1)}{3!}x^3 + \frac{f''''(1)}{4!}x^4$$

$$= 1 + -2x + \frac{6}{2}x^2 + \frac{-24}{3!}x^3 + \frac{120}{4!}x^4$$

$$1 + -2x + 3x^2 + \frac{-24}{6}x^3 + \frac{120}{24}x^4$$

$$1 + -2x + 3x^2 + -4x^3 + 5x^4$$

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

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

2b.

2b.

$f(x) = 1 - 2(x-1) + 3(x-1)^2 - 4(x-1)^3 + 5(x-1)^4 - 6(x-1)^5$

$f(0.9) = 1 - 2(0.9-1) + 3(0.9-1)^2 - 4(0.9-1)^3 + 5(0.9-1)^4 - 6(0.9-1)^5$

$= 1 + 0.2 + 0.03 + 0.004 + 0.0005 + 0.00006$

$= 1.2 + 0.034 + 0.00056$

$= 1.234 + 0.00056$

$= 1.23456$

$f(0.9) = 1.2345$

$f(1.1) = 1 - 2(1.1-1) + 3(1.1-1)^2 - 4(1.1-1)^3 + 5(1.1-1)^4$

$= 1 - 0.2 + .03 - 0.004 + 0.0005 - 0.00006$

$= 0.8265$

$F(1.1) = 0.8265$

F(0.9) = 1.2345
F(1.1) = 0.8265

2c.

$$R_n(x) = \frac{f^{(n+1)}(c)}{(n+1)!}(x-a)^{n+1}$$

$$= \frac{f^5(c)}{5!}(x-1)^5$$

$$= \frac{f^5(c)}{5!}(x-1)^5$$

$(F^5(c)/5!)(x-1)^5$

2d.

$$\frac{f^5(c)}{5!}(x-1)^5$$

$$f(0.9) = \frac{f^5(0.9)}{5!}(0.9-1)^5$$

$$= \frac{-720(0.9)^{-7}}{5!}(0.9-1)^5$$

$$-12.5445(-0.00001) = 0.000125445$$

$$f(1.1) = \frac{f^5(1.1)}{5!}(1.1-1)^5$$

$$= \frac{-720(1.0)^{-7}}{5!}(1.1-1)^5$$

$$\left|-6 \cdot (1.1-1)^5\right|$$

$$\left|-6 \cdot 0.00001\right|$$

$$0.00006$$

F(0.9) = 0.000125445
F(1.1) = 0.00006