Section 3.4 Local Linearity

1. linear function $\therefore f(x) \approx f(c) + f'(c)(x-c)$ CALC.

$\sqrt{x} = \sqrt{16.24} = f(x)$ $\quad f'(x) = \frac{1}{2\sqrt{x}}$ $\quad \sqrt{16.24} \approx 4.0299$

$x = c + h = 16.24$

Let $c = 16$ and $h = 0.24$

$$f(16.24) \approx f(16) + f'(16)(16.24 - 16)$$
$$\approx \sqrt{16} + \frac{1}{2\sqrt{16}}(0.24)$$
$$\approx 4 + \frac{1}{8}(0.24)$$
$$\approx 4.03$$

7. $f(x) = \ln x$ $\quad \ln 2.02 \approx 0.7031$ CALC.

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

$f(2.02) = \ln(2.02)$

$c = 2$

$$f(2.02) \approx f(2) + f'(2)(2.02 - 2)$$
$$\approx \ln 2 + \frac{1}{2}(0.02)$$
$$\approx 0.703$$

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

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

$f(1.05) = \frac{1}{1.05} \approx 0.952$ CALC

$c = 1$

$$f(1.05) \approx f(1) - f'(1)(1.05 - 1)$$
$$\approx \frac{1}{1} + \frac{-1}{(1)^2}(0.05)$$
$$\approx 1 - 1(0.05)$$
$$\approx 1 - 0.05 \approx 0.95$$

11. $f(1.96) \approx 0.5102$ CALC

$c = 2$

$$f(1.96) \approx f(2) + f'(2)(1.96 - 2)$$
$$\approx \frac{1}{2} + \frac{-1}{2^2}(-0.04)$$
$$\approx 0.51$$

13.

$y = \sqrt[3]{x}$

$c = 1$

$y = \sqrt[3]{1} = 1$

$(1, 1) = (c, f(c))$

$(1.059, 1.019) = (c+h, f(c+h))$

$f'(1) \approx [f(1.059) - f(1)] \left(\frac{1}{0.059}\right)$

$\approx (1.019 - 1)\left(\frac{1}{0.059}\right)$

$\approx (0.019)\left(\frac{1}{0.059}\right)$

$f'(1) \approx 0.322$

CALC

19. $\sqrt[3]{1.1} \approx 1.0323$

$f'(1.1) \approx f(1) + f'(1)(1.1 - 1)$

$\approx 1 + (0.322)(0.1) \sim$

≈ 1.0322