a) $x > 100$
b) $x > 80$
c) $x > 81.13$
d) $x > 109.55$

22) The function $y = \frac{1}{2}x^2 - 2500 \ln x$ has a global minimum when $x =$
a) 50
b) 7.824
c) 3.912
d) 5000

23) Given a cost function $C(x)$ and the corresponding average cost function $a(x)$, then the minimum average cost occurs when
a) $C'(x) = 0$
b) $a'(x) = 0$
c) $\left(\frac{C(x)}{a(x)}\right)' = 0$
d) $\left(\frac{C(x)}{x}\right)' = 0$

d) 1984

15) Given $y' = xe^{-x}$ and $y'' = e^{-x}(1-x)$, the function y has a possible extremum when $x = 0$. Determine the values of the slopes on either side of $x = 0$. These
tell you that at $x = 0$, y has
a) a local maximum
b) a local minimum
c) neither a local maximum nor a local minimum
d) a point of inflection

16) Given $y' = xe^{-x}$ and $y'' = e^{-x}(1-x)$, the function y has a point of inflection when
a) $x = 0$ only
b) $x = 0$ and $x = 1$
c) $x = 1$ only
d) $x = -1$ only

17) The effective annual yield of a 4% annual rate, compounded continuously is about
a) 4.1%b) 4.92%
c) 5.33%d) 5.85%

18) [Recall: $A = P(1 + \frac{r}{n})^{nt}$ and $A = Pe^{rt}$] The value of an investment of \$10,000 earning 4.3% interest compounded monthly for 5 years
a) \$10,180.46
b) \$10,438.58
c) \$12,343.02
d) \$12,393.86

19) In order for an investment of \$10,000 to grow to \$20,000 in 10 years, the interest rate (compounded continuously) would have to be
a) 6.9%
b) 7.3%
c) 8.2%
d) 50%

20) The demand function for a certain product is given by $q = 400 - 4p$ where p is the price of the product and q is the quantity customers will buy at that price. The price at which the revenue is maximum is
a) \$50
b) \$100
c) \$200
d) \$400

21) The function $y = \frac{200}{1+80e^{-0.04x}}$ is concave down when

8) If $f(x) = x^2e^x$, then $f'(x) =$

a) $x^2e^x + 2xe^x$
b) $x^2e^x + xe^x$
c) $x^3e^{x-1} + 2xe^x$
d) $2xe^x + ex$

9) If $g(x) = \sqrt{x^2+4}$, then $g'(x) =$

a) $\frac{1}{2\sqrt{x^2+4}}$
b) $2x\sqrt{x^2+4}$
c) $\frac{2x}{x^2+4}$
d) $\frac{x}{\sqrt{x^2+4}}$

10) If $h(x) = \ln x$, then the second derivative, $h''(x) =$

a) $\frac{1}{x}$
b) $\frac{1}{x^2}$
c) $-\frac{1}{x^2}$
d) 1

11) If the derivative of y is $y' = x^2 - 4x$, then at $x = 0$ and $x = 4$ there are possible

a) extrema of y
b) maximum slopes of y
c) points of inflection of y
d) x-intercepts of y

12) Given $y' = (x-2)^2$ and $y'' = 2(x-2)$, then there is

a) an extremum when $x = 0$
b) an extremum when $x = 2$
c) a point of inflection when $x = 0$
d) a point of inflection when $x = 2$

13−14 The number of elephants in the park can be modeled by $E(t) = 0.009t^3 - 0.6t^2 + 11.8t + 50$ where t is the number of years since 1950. Consider the interval from 1950 to 2000. On this interval . . .

13) . . . the global minimum occurs in

a) 1929
b) 1950
c) 1979
d) 2000

14) . . . a local maximum occurs in

a) 1914
b) 1950
c) 1964

MATH 115
Test 3

1) The derivative of the exponential function $f(x) = k \cdot a^x$ will always have a factor of

a) k
b) $\ln k$
c) a^x
d) $\ln x$

2) $\frac{d}{dx}\left[e^{f(x)}\right] =$

a) $f(x)e^{f(x)-1}$
b) $f'(x)e^{f(x)-1}$
c) $f'(x)e^{f(x)}$
d) $f(x)e^{f'(x)}$

3) $\frac{d}{dx}\left[\ln f(x)\right] =$

a) $\ln f'(x)$
b) $\frac{f'(x)}{f(x)}$
c) $\frac{f'(x)}{\ln f(x)}$
d) $\frac{f'(x)}{x^2}$

4) $\ln \frac{1}{7} =$

a) $-\ln 7$
b) $\ln 1 + \ln 7$
c) $(\ln 7)^{-1}$
d) $\frac{1}{\ln 7}$

5) $\frac{d}{dx}\left[mx + b\right] =$

a) m
b) x
c) b
d) 1

6) $\frac{d}{dx}\left[x^{e-1}\right] =$

a) $(e-1)x^{e-2}$
b) $(e-1)x^{-1}$
c) $(\ln x)x^{e-1}$
d) x^{e-2}

7) The function below which is constantly decreasing is

a) $y = -8x^2 - 2$
b) $y = 75\,(0.843)^x$
c) $y = e^{0.2x} - 1$
d) They are all constantly decreasing.