

Practice for Chapter 3 & 4 Covers 3.1, 3.2, 4.1 - 4.6 Name _____

Applied Calculus 05 (Goldstein10th) created 7 Mar 05 ptch34_appcalc_05g10.tst

DO NOT EXPECT THE TESTS TO BE THE SAME. TESTS MAY BE TOTALLY DIFFERENT.

You need to attend class, pay attention and do your homework to learn statistics and prepare for the tests.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

1) Differentiate: $f(x) = \frac{x^2}{x^3 - 5x + 2}$ 1) _____

2) Differentiate: $f(x) = (x^5 - 8x^2 + 5)(x^3 + \sqrt{x} - 1)$ 2) _____

3) Differentiate: $f(x) = 4(x^2 + 1)^3(x^2 + 1)^4$ 3) _____

4) Differentiate: $f(x) = \frac{x^6 + 4x^3 + 1}{x^3 + 1}$ 4) _____

5) Determine the x -coordinates of all possible relative extreme points of $P(x) = \frac{(2x - 3)^4}{(6x - 1)^2}$. 5) _____

6) Let $f(x) = \frac{x^2 - x}{x}$, $g(x) = \frac{1}{\sqrt{x}}$. Compute $f(g(x))$. 6) _____

7) Compute $\frac{dy}{dx}$ using the chain rule where $y = u^2$ and $u = 3x + 4$. 7) _____

8) Find the equation of the line tangent to the graph of $y = \frac{x}{\sqrt{8 - x^2}}$ at the point $(2, 5)$. 8) _____

9) The cost of manufacturing x units is C dollars, where $C = 4x + 6\sqrt{x} + 5$. Weekly production at t weeks from the present is estimated to be $x = 2800 + 100t$ units. 9) _____

a) Find the marginal cost, $\frac{dC}{dx}$.

b) Find the time rate of change of cost, $\frac{dC}{dt}$.

c) How fast (with respect to time) are costs rising when $t = 8$?

10) Suppose that the cost of manufacturing x units of a product is $C(x) = 6x - 2\sqrt{x} + 1$ dollars and that the production level t weeks from the present is $x = 4t^2$. 10) _____

(a) Find the rate of change in cost with respect to the production level, x .

(b) Find the rate of change in cost with respect to time.

11) Differentiate: $e^{-x^2}/4$ 11) _____

12) Differentiate: $e^{3e^{2x}}$ 12) _____

- 13) Differentiate: $f(x) = \frac{e^x + 1}{e^x - 1}$ 13) _____
- 14) Differentiate: $f(x) = e^x + e^{2x} + \frac{1}{e^{-4x}}$ 14) _____
- 15) Differentiate: $f(x) = x^3 e^{-x^3}$ 15) _____
- 16) Suppose that some garbage is dumped into a lake at time $t = 0$. The concentration of the dissolved oxygen in the water decreases at first and then begins to rise back to normal levels. Suppose that the oxygen concentration t weeks after the garbage is dumped is given by $f(t) = 100 + 10e^{-t} - 10e^{-.2t}$. At what value of t will the concentration of the dissolved oxygen be lowest? 16) _____
- 17) Determine all solutions of the differential equation $y' = \frac{7}{6}y$. 17) _____
- 18) Determine all functions $y = f(x)$ such that $y - 4y' = 0$ and $f(0) = \frac{2}{3}$. 18) _____
- 19) Differentiate: $\frac{\ln x}{x^3}$ 19) _____
- 20) Differentiate: $e^x \ln 2x$ 20) _____
- 21) Differentiate: $(x + 3 \ln x)^4$ 21) _____
- 22) Differentiate: $\frac{\ln 3x}{\ln x}$ 22) _____
- 23) Differentiate: $f(x) = \frac{\ln x}{e^x}$ 23) _____
- 24) Differentiate: $f(x) = x \ln(2x - x^2)$ 24) _____
- 25) Differentiate: $\ln \left[\frac{\sqrt{x}e^x}{x^2 + 1} \right]$ 25) _____
- 26) Use logarithmic differentiation to differentiate: $(3x + 1)^5(2x - 1)^{-2}(x + 3)^4$ 26) _____
- 27) Use logarithmic differentiation to differentiate: $4^x \cdot 5^x \cdot 6x^3$ 27) _____

Answer Key

Testname: PTCH34_APPCALC_05G10

1)
$$\frac{2x(x^3 - 5x + 2) - x^2(3x^2 - 5)}{(x^3 - 5x + 2)^2}$$

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2)
$$(5x^4 - 16x)(x^3 + \sqrt{x} - 1) + (x^5 - 8x^2 + 5)\left(3x^2 + \frac{1}{2\sqrt{x}}\right)$$

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3)
$$56x(x^2 + 1)^6$$

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4)
$$\frac{3x^2(x^6 + 2x^3 + 3)}{(x^3 + 1)^2}$$

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5)
$$x = \frac{3}{2}, -\frac{7}{6}$$

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6)
$$\frac{1}{\sqrt{x}} - 1$$

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7)
$$\frac{dy}{dx} = 18x + 24$$

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8)
$$y = x + 3$$

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9) a)
$$4 + \frac{3}{\sqrt{x}}$$

b)
$$\left(4 + \frac{3}{\sqrt{2800 + 100t}}\right) \cdot (100)$$

c) Costs are rising at the rate of \$405 per week

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10) (a)
$$C'(x) = 6 - \frac{1}{\sqrt{x}}$$

(b)
$$\frac{d}{dt} C(p(t)) = 48t - 4$$

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Answer Key

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11) $-\frac{x}{2}e^{x^2}/4$

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12) $6e^3e^{2x} + 2x$

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

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14) $f'(x) = e^x + 2e^{2x} + 4e^{4x}$

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15) $f'(x) = -3x^5 e^{-x^3} + 3x^2 e^{-x^3}$

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16) $t = \frac{5}{4} \ln 5$

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17) $y = Ce^{7/6x}$, C any constant

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18) $y = \frac{2}{3}e^{(1/4)x}$

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19) $\frac{1 - 3 \ln x}{x^4}$

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20) $e^x \ln 2x + \frac{e^x}{x}$

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21) $4(x + 3 \ln x)^3 \left(1 + \frac{3}{x}\right)$

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Answer Key

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$$22) \frac{-\ln 3}{x(\ln x)^2}$$

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$$23) f'(x) = \frac{1}{xe^x} - \frac{\ln x}{e^x}$$

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$$24) f'(x) = x \cdot \frac{2-2x}{2x-x^2} + (\ln 2x - x^2)$$

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$$25) \frac{1}{2x} + 1 - \frac{2x}{x^2 + 1}$$

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$$26) \left[\frac{15}{3x+1} - \frac{4}{2x-1} + \frac{4}{x+3} \right] (3x+5)^5 (3x-1)^{-2} (x+3)^4$$

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$$27) 4^x \cdot 5^x \cdot 6x^3 \left(\ln 20 + \frac{3}{x} \right)$$

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